

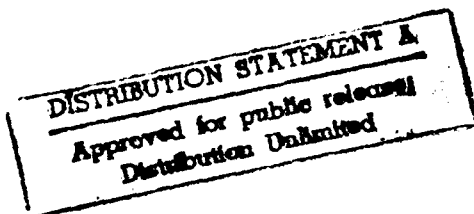


The Determination of Navy Family Housing Requirements

NA101R1



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Executive Summary

THE DETERMINATION OF NAVY FAMILY HOUSING REQUIREMENTS

The Naval Facilities Engineering Command (NAVFAC) is the primary agent responsible for overseeing the Navy's family housing program and for making recommendations for construction programs at Naval activities throughout the world. The Navy has an aggressive referral program to help families find available and affordable housing in the private sector. Under the assumption that resources will be available, NAVFAC will target areas with insufficient private housing for the construction of new units, the leasing of additional units, and/or the upgrading of existing units.

Programming for additional family housing units requires that NAVFAC determine the supply of, and demand for, family housing at each Navy installation (both now and 5 years into the future), identify locations with deficits, and describe the size and composition of such deficits. The current process used by NAVFAC to assess the supply and demand has not changed significantly during the past 20 years. In response to increased requirements for greater precision and responsiveness, closer scrutiny of Navy family housing programs, and internal initiatives relating to quality management, NAVFAC asked LMI to conduct a thorough study of the entire requirements determination process.

Despite anticipated budget cuts, force reductions, and base closures, NAVFAC still must predict future family housing requirements. Some locations will increase their current size, and others have existing (unmet) needs. To make this process more effective and efficient, we recommend that NAVFAC take action in four broad areas:

- Improve the primary source of family housing demand data – the base loading system – by increasing automation, preparing more complete housing activity listings, improving current and projected personnel data processing, and revising the overall requirements determination schedule.

- Improve the family housing survey by designing better questionnaires, revising the sampling procedures, developing more effective local processing, and performing more thorough editing.
- Improve the military and private housing asset data by streamlining input documents, making more accurate and detailed market share estimates, and preparing more focused and standardized market analyses.
- Improve the overall understanding of the process and the utilization of its outputs by providing better training, documentation, communications, and data sharing.

As a longer-term activity, we also recommend that NAVFAC start developing a system design and an implementation plan for converting as much of the process as possible to personal computers. Although the process may be affected by future DoD actions (e.g., new suitability criteria and consolidated variable housing allowance forms), it is important that NAVFAC begin making improvements as soon as possible.

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CHAPTER 1

INTRODUCTION

The U. S. Navy is committed to providing adequate housing for its military families. The preferred source of this housing is the private market in communities surrounding Navy installations. Local referral programs help determine the availability of affordable private housing. Where such housing is not available or is deemed inadequate on the basis of DoD suitability standards, family housing units may be procured using military construction (MILCON) funds.

The Navy provides qualifying personnel with a basic allowance for quarters (BAQ) to help defray the cost of private housing. Its members who are married or otherwise responsible for dependents are eligible for BAQ at the higher "with dependents" rate. Since housing costs vary considerably from one Navy installation to another, the Navy provides an additional variable housing allowance (VHA) at selected locations.

REQUIREMENTS DETERMINATION SYSTEM

Overview

For almost 20 years, the Navy has used a semiautomated system to project family housing requirements. This process is managed by the Naval Facilities Engineering Command (NAVFAC) headquarters, but Engineering Field Divisions (EFDs), shore activities, and the Facilities Systems Office (FACSO) are also actively involved in preparing estimates.

By comparing activity-level estimates of family housing supply and demand, NAVFAC can determine the location, size, and composition of any current or projected family housing deficits. It uses those results to justify improving and modernizing existing Navy-owned housing units, leasing private community housing, and/or recommending MILCON projects.

According to NAVFAC estimates, almost 270,000 military and civilian families currently require housing at Navy installations, but only about 220,000 suitable on- or off-post housing units are available. This implies a current worldwide deficit of about 50,000 units, which NAVFAC estimates will shrink to about 30,000 units over the next 5 years as new assets become available and requirements decrease (because of force reductions).

NAVFAC can reduce this deficit through MILCON, Section 801 housing (build to lease), Section 802 housing (rental guarantee), Section 2667 housing (Government land outleasing), cooperative housing, construction of mobile home parks, purchase of existing housing, transfer of other DoD units, improvements to existing quarters, and/or improved housing referral services.¹ The President's fiscal 1991 budget included more than \$760 million for the Navy's family housing program, with more than \$120 million earmarked for constructing about 1,000 new units at five locations.

Base Loading System

The base loading system (BLS) is the official source of personnel strength information for planning and programming at Navy shore activities. It provides detailed current and future data on the location and personnel strengths of all relevant Navy (and other Service) units. It serves as the primary source of data on gross current and projected family housing demand at each location.

Survey

On-site surveys using Department of Defense (DD) Form 1376, *Family Housing Questionnaire*, collect data on such variables as housing suitability, separation status, and private-sector assets. The survey is administered to selected military personnel at Navy installations who are eligible for BAQ at the "with dependents" rate, plus key civilians whose jobs require on-base housing at certain locations outside the continental United States (OCONUS). Installations are surveyed at least every five years, with 50-60 installations typically surveyed in any given year.

¹Increased basic and/or variable housing allowances would also decrease the deficit, but these are not under the Navy's control.

Additional Data

Many additional data elements used in the requirements determination process are compiled from various sources and entered into the master activity general information control (MAGIC) system. These elements include historical data on separations, current military housing inventory and occupancy, projected changes to military housing assets, vacant private-sector rental units, marriage rates, family composition, bedroom factors, and variable housing allowances.

Level of Detail

Requirements are calculated at the family housing complex level (a complex is defined as one or more installations served by the same housing office). In order to more closely match resources with requirements, the data are analyzed separately within each complex for six military pay grade groups (plus key civilians): O6-O10, O4-O5, W1-O3, E7-E9, E4-E6, and E1-E3. The data are also analyzed separately within each pay grade group for three bedroom categories: 1-2, 3, and 4+.

Calculations and Outputs

Once all of the data elements of the process are collected, family housing requirements can be determined. That process consists of four basic steps:

- DD 1376 data are tabulated and displayed along with current personnel strengths in preliminary DD Form 1377, *Raw Data – Tabulation of Family Housing Survey*.
- DD 1376 data are extrapolated to the overall population and linked to current personnel and housing asset data in final DD Form 1377, *Tabulation of Family Housing Survey*.
- DD Form 1377 results are projected 5 years ahead using additional data in DD Form 1378, *Determination of Housing Requirements and Project Composition*.
- DD Form 1378 results, along with market analysis data and staff programming, are used to prepare DD Form 1523, *Military Family Housing Justification*.

NAVFAC combines all EFD program recommendations into one package and submits it as a budget item within the Navy Family Housing portion of the MILCON appropriation.

Need For Improvements

The Navy's current system for determining family housing requirements was developed almost 20 years ago. Time, associated staff turnover, greater scrutiny of military construction programs, budget cuts, base closures and realignments, and proposed military force reductions have created a need to update, improve, increase the responsiveness of, and more thoroughly document this system.

REPORT ORGANIZATION

The next five chapters provide detailed discussions of each aspect of the process and present our findings on them. In turn, we discuss base loading (Chapter 2), the family housing questionnaire (Chapter 3), other inputs (Chapter 4), market analysis (Chapter 5), and requirements calculations and outputs (Chapter 6). Because the various aspects are interrelated, we present all of our conclusions and recommendations in Chapter 7. The report also includes two appendices: Appendix A presents detailed ship-shore comparisons from a special survey conducted at Long Beach, Calif.; and Appendix B documents the calculations underlying DD Forms 1377 and 1378.

CHAPTER 2

THE BASE LOADING SYSTEM

BACKGROUND

The BLS contains current and projected data on where individual units are assigned, the number and pay grade distribution of personnel assigned to each unit, and how many of those personnel are eligible for BAQ at the "with dependents" rate. The Chief of Naval Operations (CNO) has mandated that the BLS be used as the official source for personnel strength information for planning and programming at naval shore activities. In addition to its other uses, it plays a key role in determining the demand for family housing.

DATA SOURCES

Personnel data used in the BLS come from several sources: current Navy military and civilian strengths come from the Bureau of Naval Personnel (BUPERS); projected Navy military strengths come from the Manpower and Personnel Management Information System (MAPMIS); Marine Corps personnel data come from separate Marine Corps information systems; average on-board student counts come primarily from the Chief of Naval Education and Training (CNET); and data on other Services and average on-board counts for transient, rotational, and reserve personnel at Navy complexes come from individual shore activities.

Data from several other sources are used to determine where all these personnel are (and will be) assigned. Complex and unit identification codes come from CNO and NAVFAC (through MAGIC). Aircraft unit assignments and composition come from the aircraft program data file (APDF). Ship homeport assignments come from the ships management information system (SMIS). Finally, ship overhaul schedules come from the Chief of Naval Operations (OP-43).

DEFINITIONS AND CONCEPTS

The BLS has two main building blocks. One is the complex code (CC), used to identify each family housing complex. Each family housing complex may in turn be

associated with one or more subcomplexes (subcomplex designations are used for bachelor housing and other purposes). Some Navy activities may not have a CC if they do not provide any housing.

The second building block is the unit identification code (UIC), used to identify each operational unit. UICs for Navy (and Marine Corps) units are assigned by CNO; dummy UICs are assigned to non-Navy units by NAVFAC. By linking each person to a UIC, each UIC to a subcomplex, and each subcomplex to a CC, the BLS can determine how many people will require family housing – both now and in the future – at each complex. Conversely, people assigned to units whose UICs are not linked to a CC are not included in the base loading process.

REPORTS

Housing Activity Listing

The housing activity listing (HAL) links Navy activities, plus other Service activities located on Navy bases, to housing complexes and subcomplexes. The HAL displays a UIC, short title, activity type (large ship, host/tenant, etc.), deployment code, and parent UIC for each activity. Figure 2-1 shows the format of the HAL, which is generated for each complex and subcomplex.

Complex: _____ EFD: _____
 Subcomplex: _____ Major Claimant: _____

ACTIVITY IDENTIFIER	SPECIAL AREA	UNIT SHORT TITLE (SPECIAL AREA NAME)	ACTIVITY TYPE	DEPLOYMENT CODE	PARENT UIC

FIG. 2-1. HOUSING ACTIVITY LISTING FORMAT

The HAL is the key to determining how many people are at each complex for base loading. The deployment code is also used to identify people who are not available for the survey process. A preliminary HAL is first generated by FACSO for each complex and subcomplex based on current MAGIC data. This listing is reviewed by each activity and EFD, and changes are made where appropriate. These changes

are incorporated into the MAGIC file by NAVFAC personnel, and an updated HAL is then generated.

Current Personnel Summary

While the HAL ensures that the correct UICs are associated with each complex, the current personnel summary (CPS) ensures that the correct personnel counts (by pay grade and BAQ status) are associated with each UIC. The CPS is generated using current data from the BUPERS file, which is sorted by pay grade group. BAQ eligibility is determined on the basis of a dependency code contained in the BUPERS file. Figure 2-2 shows the format of the CPS.

Along with the CPS, FACSO also generates a worldwide proration table (WWPT), which identifies the current pay grade spreads. Data from this report will appear in all DD forms submitted to OSD and Congress by NAVFAC for MILCON programming actions.

Complex: UIC:	Officers					Total officers	Enlisted						Total enlisted	Civilians	Total personnel
	W1-02	03	04-05	06	07-010		E1	E2-E3	E4	E5-E6	E7	E8-E9			
Permanent party personnel															
Entitled to BAQ with dependents															
Students 20 weeks or more															
Entitled to BAQ with dependents															
Students 20 weeks or less															
Students "A" school															
Transients															
Rotational															
Reserves															
Total															

FIG. 2-2. CURRENT PERSONNEL SUMMARY FORMAT

Projected Personnel Summary

The projected personnel summary (PPS) has the same format as the CPS, but differs in three key respects. First, it reports projected (rather than current)

strengths and is therefore a classified document. Second, its primary data source is MAPMIS, rather than BUPERS. Third, its pay grade breakdowns are based on CPS data (or estimated using the WWPT for student units, new units, and other special cases). The PPS is used to support MILCON programming actions.

Consolidated Personnel Summary

The consolidated personnel summary displays data from both the CPS and the PPS. This report, which is classified, is used to help identify discrepancies or omissions. It also contains two items not on the CPS or PPS: an activity type code for each unit (e.g., host/tenant or large ship), and effective dates and new complex codes (both current and projected) for any units changing homeport or location within 5 years. A preliminary report is reviewed and updated by the activities and EFDs. Figure 2-3 shows the format of the Consolidated Personnel Summary.

UIC/SA Unit short title	Permanent party			Students M2		Students L20		Students "A" school		Transients		Rotational		Reserves	
	Off (A)	Enl (B)	Civ (C)	Off (D)	Enl (E)	Off (F)	Enl (G)	Off (H)	Enl (I)	Off (J)	Enl (K)	Off (L)	Enl (M)	Off (N)	Enl (O)
Current															
Projected															

FIG. 2-3. CONSOLIDATED PERSONNEL SUMMARY FORMAT

Activity Type Summary

The activity type summary tabulates the permanent party and student strengths by pay grade and BAQ status for each activity type. Separate reports are generated using current and projected data. The activity type summary is used to project the size and makeup of Navy populations at similar activity types in the future. Activity types also play an important role in determining bachelor housing requirements. The format for the activity type summary is shown in Figure 2-4.

TIMETABLE

The base loading process goes on throughout most of the year. Historically, the schedule for the key milestones specified by NAVFAC has been as follows (some of the dates have changed for 1992):

Complex total	Officers					Total officers	Enlisted						Total enlisted
	W1-Q2	O3	O4-O5	O6	O7-O10		E1	E2-E3	E4	E5-E6	E7	E8-E9	
Activity type Personnel type													
(3) Host/tenant 1. Permanent part 2. Entitled to BAQ													
(4) Fleet Air Squad 1. Permanent part 2. Entitled to BAQ													
(5) Mobile Units 1. Permanent part 2. Entitled to BAQ													
(6) Large Ships 1. Permanent part 2. Entitled to BAQ													
(7) Small Ships 1. Permanent part 2. Entitled to BAQ													
(8) Two-crew subs 1. Permanent part 2. Entitled to BAQ													
(9) Students 3. Stu M20 weeks 4. Entitled to BAQ 5. Stu L20 weeks 6. Stu "A" school													

FIG. 2-4. ACTIVITY TYPE SUMMARY FORMAT

- **May** NAVFAC begins to collect all personnel data from the various sources and distributes a preliminary HAL to the EFDs and complexes/subcomplexes for updating.
- **June** Complexes mail updated HALs to EFDs.
- **July** NAVFAC begins to collect all aircraft and ship unit data from the various sources and receives updated preliminary HALs from the EFDs.
- **August** NAVFAC generates ship homeport and ship overhaul reports and updates FACSO data base with changes to HALs.

- September CNO distributes preliminary CPS to the EFDs and complexes/subcomplexes for review, and NAVFAC distributes final HALs.
- October NAVFAC requests from each complex/subcomplex a list of units whose deployment codes have changed, and EFDs and complexes/subcomplexes mail updated CPS to NAVFAC.
- November NAVFAC updates FACSO data base with changes to CPS.
- December NAVFAC distributes final current/projected personnel, current/projected activity type, and consolidated personnel summaries to the EFDs and complexes/subcomplexes.

FINDINGS

Timing

The combined base loading and questionnaire processes overlap each other and span a total of more than 12 months. That timing creates four problems. First, the results of both processes are not available until late spring, making it hard for NAVFAC and the EFDs to prepare for the annual construction programming cycle. Second, the base loading process begins for the next year while NAVFAC and the EFDs are still busy generating and analyzing the previous year's results. Third, milestones generated by the Navy's Shore Facilities Programming Board are difficult to meet. Finally, the NAVFAC Notice governing these processes (NAVFACNOTE 11101) often does not come out until the processes are well underway.

The base loading schedule is heavily influenced by NAVFAC's desire to have the field review preliminary HAL, CPS, and PPS data. The HAL is a critical document, and since field input is needed to ensure its completeness and accuracy, its review is worth the time added to the process. Field input is also needed for other Services, key civilians, and special groups (i.e., students, etc.).

However, field review of CPS data on regular Navy military personnel does not appear to be cost-effective. NAVFAC compared CPS data to local personnel records at Pensacola and Port Hueneme, and found that unit-level strength counts for the same date rarely varied by more than one or two persons. Nevertheless, NAVFAC changes thousands of CPS data points as a result of its field review. Furthermore, most of those changes are increases, and since NAVFAC has no independent way to

make offsetting decreases, the updates generate total strength that no longer match BUPERS or other official statistics.

Most of the field corrections to the PPS are also increases, and again result in totals that do not match official Navy figures. In fact, because of timing and methodological differences, totals even differ among the various base loading reports themselves. While the field review can compare the CPS with local personnel records, it has no way to verify the PPS for Navy military personnel (since the data are only available from MAPMIS), and thus its value is even more questionable.

The base loading review process is lengthy for several other reasons. Some reports are classified, making it harder for the activities to obtain and review them. Some of the supporting data come from homeported ships that are deployed, creating additional delays. Furthermore, each change (and there can be thousands) must be entered at FACSO as a transaction, which is time- and resource-consuming.

Ship and air squadron units present several unique problems for base loading. First, they move frequently, and some of their moves are temporary (rotation, overhaul, etc.) while others are semipermanent. Second, they have related support activities, which may or may not move with them. Third, the associated data bases are not yet automated (although NAVFAC is in the process of rectifying that problem). Finally, they are not always consistently identified in all data bases (NAVFAC is in the process of establishing automated UIC and CC linkages).

A related issue is the effective dates for the CPS and PPS. The Navy usually makes significant updates to the relevant data files in September, January, and May (for major budgeting and programming submissions). The May update is too late to incorporate into the requirements determination process. However, by obtaining personnel data in August (to allow sufficient time for review), NAVFAC also misses out on the September and January updates.

Since CPS results are needed to select samples at locations administering the family housing questionnaire (see Chapter 3), delaying the CPS until after the January update is impractical. However, the September update could be incorporated into the CPS if the review process were shortened. Since the updates of projected strength are often more significant and since the PPS results are not used

until the survey has been completed, both the September and January updates could theoretically be incorporated into the PPS.

NAVFAC is concerned that — at least until this year — it has not fully reflected mandated force reductions in its analysis. Unfortunately, the Navy has not provided NAVFAC with the unit and grade breakdowns that are needed to determine the impact of these reductions on future family housing requirements (although the Navy has decided how large the overall cuts will be, it has been slow to decide where the cuts will occur). The conversion in FY91 from billet data to strength data improved the timeliness of the projections, since billet changes tend to lag strength changes. Nevertheless, the fact remains that NAVFAC is not using the very latest detailed projections in its process.

Coverage

Problems associated with the coverage of certain groups undermine the base loading system's overall completeness and accuracy. One such group is other Service personnel. Data on the existence and strengths of other Service units have historically been provided by the activities. Evidence from our site visits suggests that these data (along with the pay grade distributions used by NAVFAC) are frequently incomplete and/or outdated.

About three-fourths of these other Service personnel are Marines. For the next cycle, NAVFAC hopes to obtain automated personnel data from the Marine Corps and correct the coding of Marine Corps units (some of which have mistakenly been assigned UICs beginning with "N" for Navy). These two steps will greatly improve the other Service personnel data. However, the reliance on manual inputs from activity staff will continue to cause problems in counting the 5,000-6,000 Army, Air Force, other DoD, and Coast Guard personnel eligible for family housing at Navy complexes.

Thousands of civilians work for the Navy, and most of them can be identified from the BUPERS file. However, only a few hundred are entitled to family housing, and those key civilians with families (who are concentrated at a few OCONUS complexes) must be identified locally. Similarly, the Navy has thousands of student, rotational, and transient personnel. In general, strength data for those groups are carried over from the previous year's base loading, but both the extent to which this

information is updated and the manner in which it is updated appear to vary widely (this is less of a problem for students).

Another issue is the numbers and types of Navy military personnel included on the BUPERS file who are excluded from base loading counts for family housing (many of these personnel are instead included in base loading counts for bachelor housing). People are dropped for three reasons:

- They are categorically ineligible for family housing based on their BUPERS accounting category code (ACC), which defines their status (i.e., regular, student, transient, etc.).
- They are individually ineligible for family housing (i.e., ineligible for BAQ at the "with dependents" rate) based on their BUPERS dependency code, which indicates their marital status and number of dependents.
- Their unit is not linked to a CC in MAGIC, and thus either their complex cannot be determined or they are at a location where housing is provided by another Service/Agency.

Table 2-1 summarizes the effect of these three conditions. NAVFAC has revised the list of valid ACCs over the years, and in FY91 about 70,000 persons (12 percent of the total BUPERS count) were dropped on the basis of their ACC. The largest groups dropped were in the lowest enlisted and officer grades.

In FY91, about 264,000 additional personnel (50 percent of the total remaining after the ACC edits) were dropped on the basis of their dependency code. NAVFAC recently added a check for military spouses at the same location to avoid double counting those families (which would overstate requirements). The effects of the military spouse check on the marriage factors have not been estimated; barring any change in methodology, these effects will phase in over a 3-year period.

The problem of missing CCs has decreased each year because the HAL is used to continually update MAGIC. In addition, NAVFAC is developing a geographical locator file to facilitate the UIC-to-CC linkage. However, the MAGIC match is still significant; in FY91, over 19,000 additional personnel (7 percent of the total remaining after the dependency code edits) were dropped on the basis of their CC (or lack thereof).

As noted earlier, NAVFAC uses pay-grade-group-level marriage factors to estimate BAQ eligibility for projected personnel (and some current personnel) at each

TABLE 2-1

BASE LOADING NAVY MILITARY PERSONNEL DATA

Pay grade	(1) Total number on file ^a	(2) Personnel in (1) with valid ACC		(3) Personnel in (2) eligible for BAQ ^b		(4) Personnel in (3) with complex code	
		Number	%	Number	%	Number	%
O10	9	9	100	9	100	8	89
O9	29	29	100	29	100	27	93
O8	85	85	100	84	99	76	90
O7	124	122	98	118	97	103	87
O6	3,822	3,752	98	3,378	90	2,981	88
O5	7,626	7,410	97	6,274	85	5,520	88
O4	13,424	13,161	98	10,281	78	9,199	89
O3	22,360	21,755	97	14,168	65	12,876	91
O2	12,376	12,031	97	5,106	42	4,908	96
O1	8,817	7,390	84	2,109	29	1,994	95
W4	639	635	99	569	90	545	96
W3	677	671	99	597	89	546	91
W2	1,294	1,256	97	1,120	89	1,085	97
W1	0	0	N/A	0	N/A	0	N/A
Officers	71,282	68,306	96	43,842	64	39,868	91
E9	4,841	4,764	98	4,265	90	4,025	94
E8	10,201	9,994	98	8,703	87	8,055	93
E7	34,942	34,137	98	28,370	83	25,959	92
E6	85,231	82,565	97	62,250	75	56,835	91
E5	135,345	105,129	78	60,426	57	56,292	93
E4	104,788	100,409	96	34,668	35	33,032	95
E3	70,911	64,165	90	13,665	21	13,192	97
E2	50,896	43,630	86	5,898	14	5,695	97
E1	30,354	15,411	51	1,647	11	1,594	97
Enlisted	527,509	460,204	87	219,892	48	204,679	93
Total	598,791	528,510	88	263,734	50	244,547	93

^a Bureau of Naval Personnel (8/90).^b At the "with dependents" rate.

complex. Table 2-1 shows that the rate of eligibility for BAQ varies dramatically by individual pay grade, reflecting differences in the ACC mix and in family composition patterns. The use of grouped marriage factors can therefore lead to inaccurate estimates, particularly for lower officer and lower enlisted grades.

Base Closures and Force Reductions

Base closures and force reductions will greatly complicate the base loading process over the next several years. A number of units will be moved or eliminated, making the HAL updating process both more difficult and more critical. Until decisions about aggregate force reductions are translated into specific cuts by unit and pay grade, NAVFAC will face difficulties in accurately projecting future strengths, and using the most up-to-date information will be even more important. Finally, current marriage factors will no longer apply to ships that are given new reserve or training missions since the demographic compositions of their crews will change.

CHAPTER 3

FAMILY HOUSING QUESTIONNAIRE

INTRODUCTION

To determine family housing requirements accurately, NAVFAC must have data on how many current personnel are separated from their families, how many are unsuitably housed, how many rent or own private housing, and how many bedrooms each person has. At present, such data can only be obtained directly from the Service members themselves.

Therefore, NAVFAC distributes the *Family Housing Questionnaire* (DD Form 1376) to Navy and other military personnel eligible for BAQ at the "with dependents" rate, plus married key civilians, at Navy installations. The information reported on that questionnaire directly affects DD Forms 1377, 1378, and 1523. It is also used for trend analysis, to determine pay grade and bedroom composition of future projects, as supporting data for personnel support facilities, as justification for excessing/disposal of family housing assets, and for other miscellaneous purposes.

The current questionnaire process largely reflects the results of a study performed for NAVFAC in 1967-68 by the Battelle Memorial Institute. In this chapter, we present a detailed description and a discussion of our findings in eight major areas: site selection, questionnaire design, sampling, response, local processing, FACSO processing, housing suitability, and sampling error.

SITE SELECTION

Description

NAVFAC's policy is that all family housing complexes should be surveyed at least once every 5 years, and annually if they are included in the Navy's family housing construction program. The policy also requires a site survey for the establishment of a new complex or the closure/realignment of an existing complex. The annual NAVFAC Notice 11101 identifies the complexes that are to administer the *Family Housing Questionnaire* and the method they should use in doing so.

Most complexes with more than 1,000 families conduct a sample method survey (SAMS), in which a random sample of personnel with dependents is asked to complete the questionnaire. Most complexes with less than 1,000 families conduct a census survey in which all personnel with dependents are asked to complete the questionnaire. To account for special situations, EFDs sometimes make minor subsequent revisions to NAVFAC Notice 11101.

Findings

In each of the past 4 years, NAVFAC has selected 50 to 60 housing complexes to be surveyed (out of a universe of about 130). However, the number of complexes actually surveyed is sometimes significantly less than the number initially selected. Considerable overlap occurs from year to year; of the 40 complexes for which FACSO received survey data in FY91, 29 had also been surveyed during FY90. On the other hand, the most recent FACSO survey data for 21 other complexes are more than 5 years old, and FACSO has no survey data at all for another 14 complexes.

A number of these housing complexes with old or missing data are in the Pacific Division EFD, where logistical difficulties and unique local housing situations may make the survey impractical and/or irrelevant. Some of the other complexes with old or missing data are new and/or very small, but others fall into neither category. Some of the data being used by FACSO are nearly 10 years old, yet we found nobody at FACSO or NAVFAC (and very few people at the EFDs) keeping track of the latest survey date for all Navy complexes. We also found that for a few complexes, the EFDs believe FACSO should have more recent survey data than that which appears in their files.

QUESTIONNAIRE DESIGN

Description

The current edition of the *Family Housing Questionnaire* is shown in Figure 3-1. Most of the questions are self-explanatory, and several have multiple applications. The data are used to determine family housing eligibility, separation status, required bedrooms, and the characteristics and suitability of private sector housing units.

FAMILY HOUSING QUESTIONNAIRE

(Please read the INSTRUCTIONS and PRIVACY ACT STATEMENT on reverse before completing this questionnaire)

REPORT CONTROL SYMBOL

1. NAME (Print last, first, middle initial)

2. LOCAL ADDRESS—THIS IS THE ADDRESS WHERE YOU ARE LIVING WITH YOUR FAMILY IF YOUR FAMILY IS NOT WITH YOU INDICATE BACHELOR ENLISTED QUARTERS SHIP BOQ OR WHATEVER IS APPROPRIATE

3. ORGANIZATION (Include name and unit number. You may use abbreviations.)

4. DUTY PHONE NUMBER

5. SOCIAL SECURITY NUMBER

6. PAY GRADE (Put an X in appropriate box)

OFFICER	ENLISTED	CIVILIAN
<input type="checkbox"/> O10	<input type="checkbox"/> E09	<input type="checkbox"/> GS-1 thru 4
<input type="checkbox"/> O09	<input type="checkbox"/> E08	<input type="checkbox"/> GS-5 thru 6
<input type="checkbox"/> O08	<input type="checkbox"/> E07	<input type="checkbox"/> GS-7 thru 11
<input type="checkbox"/> O07	<input type="checkbox"/> E06	<input type="checkbox"/> GS-12 thru 14
<input type="checkbox"/> O06	<input type="checkbox"/> E05	<input type="checkbox"/> GS-15 and above
<input type="checkbox"/> O05	<input type="checkbox"/> E04	<input type="checkbox"/> WS-1 thru 3
<input type="checkbox"/> O04	<input type="checkbox"/> E03	<input type="checkbox"/> WS-4 thru 17
<input type="checkbox"/> O03	<input type="checkbox"/> E02	<input type="checkbox"/> WS-18 thru 27
<input type="checkbox"/> O02	<input type="checkbox"/> E01	<input type="checkbox"/> WS-28 and above
<input type="checkbox"/> O01	<input type="checkbox"/> E01	

7. ARE YOU MARRIED?

8. DEPENDENTS (DO NOT INCLUDE YOUR SPOUSE)

9. IS YOUR FAMILY LIVING WITH YOU AT THE LOCAL ADDRESS YOU GAVE IN ITEM 2?

10. FOR THOSE OF YOU WHO ANSWERED 8A OR 8B AND CONSIDERING YOUR CURRENT SITUATION, WOULD YOU CHOOSE?

11. IF YOU ARE NOT CURRENTLY ACCOMPANIED BY YOUR FAMILY IN THE AREA, YOU HAVE FURNISHED THE QUESTIONNAIRE, PLEASE SIGN YOUR NAME AND ENTER THE DATE ON LINE 16.

12. NUMBER OF BEDROOMS—HOW MANY BEDROOMS ARE THERE IN THE HOME WHERE YOU LIVE?

11. TYPE OF HOUSING—IS WHAT TYPE OF HOUSING ARE YOU NOW LIVING? (SELECT ONE ONLY)

12. CONSIDERING YOUR PRESENT SITUATION, WOULD YOU CHOOSE TO?

13. NUMBER OF MILES—HOW MANY MILES IS IT ONE WAY FROM YOUR LOCAL HOME TO YOUR DUTY STATION? (nearest mile)

14. TRAVEL TIME—HOW LONG DOES IT TAKE YOU TO TRAVEL ONE WAY FROM YOUR LOCAL HOME TO YOUR DUTY STATION? (Put an X in appropriate box)

15. AVERAGE MONTHLY HOUSING COSTS—HOW MUCH DOES YOUR HOUSING COST YOU ON THE AVERAGE PER MONTH? (Put an X in appropriate box)

16. CONSIDERING YOUR PRESENT INCOME AND THE LOCAL COMMUNITY, DO YOU FEEL THAT THE HOUSING YOU NOW LIVE IN IS SUITABLE OR UNSUITABLE?

17. IF YOU OWN OR ARE BUYING A HOUSE OR MOBILE HOME, DID YOU CHOOSE HOME OWNERSHIP TO PREVENT SEPARATION FROM YOUR FAMILY?

18. IF YOU OWN OR ARE BUYING A MOBILE HOME AND IN QUESTION 16 YOU INDICATED IT WAS UNSUITABLE FOR ONE OR MORE REASONS, WHAT DID YOU GIVE YOUR RESPONSE ON?

19. SIGNATURE AND DATE

FIG. 3-1. FAMILY HOUSING QUESTIONNAIRE

FY91 Results

In our analysis of the FY91 questionnaire results, we identified seven problems with the questionnaire design. First, many respondents apparently include their spouses among their dependents (Question #7) despite instructions not to do so, complicating the calculation of bedroom requirements. NAVFAC assumes that dependents of a certain age (19 to 45 for Grades E1 through E5, and 25 to 45 for all other grades) are spouses and deletes them. This additional edit, which was introduced in FY91, substantially reduces the problem but does not eliminate it (some spouses are undoubtedly still included, while some dependent parents are probably deleted).

Second, the explanations of the "no" options in the living-with-family question (#8) are not clear. Whether a person is voluntarily or involuntarily separated from his/her family has a direct impact on the deficit calculation. Some activities type in additional wording to clarify the question. Furthermore, since the coding scheme does not distinguish "b" from "c" responses, information on the reason for involuntary separation is lost.

Third, the preference questions (#9 and #12) are hypothetical and may not be valid predictors of future behavior. Since #9 applies to involuntary separations, only 791 out of 24,226 postedit respondents answered it. In addition, over 20 percent of all respondents did not answer #12, and the random assigning of almost 2,000 additional responses to this question by the FACSO edit program undermined the meaningfulness of these data.

Fourth, interpretation of the suitability question (#16) for utilities, condition, equipment, and neighborhood is highly subjective, although the confirm/reverse inspection process explicitly addresses this issue. Some complexes had much higher rates of unsuitability for these criteria than others. Furthermore, some respondents indicated that their units were both suitable and unsuitable. That contradiction may reflect a disparity between official and personal standards, or it may reflect confusion caused by the structure of the question.

Fifth, considerable confusion seems to exist in the interpretation of the reason-for-purchasing question (#17), which is used to determine whether owners can be classified as unsuitable. Since 28 percent of the applicable FY91 respondents (i.e., owners) answered "yes," and since over two-thirds of those respondents answering

"yes" lived in units with three or fewer bedrooms, financial considerations (taxes, etc.) and personal preferences may have been more important than an inability to find affordable rental housing with sufficient bedrooms.

Sixth, we found no use for the mobile home question (#18). Only 90 of the 24,226 postedit respondents answered it, and it has no role in the deficit calculation (its responses have historically been used to help shape policies affecting mobile homes). Furthermore, 18 questionnaires were rejected by FACSO's edit program because of invalid responses to this question, even though it is no longer used.

Finally, no space is available to designate the respondent's Service branch; thus, NAVFAC cannot identify non-Navy respondents at Navy complexes. Although the FACSO data base includes a Service code for each survey record, that code is based on the complex rather than the individual. This lack of Service identification complicates the calculation of survey response rates, since non-Navy personnel are not included among the FACSO selectees.

SAMPLING

Description

For housing complexes undergoing a SAMS, Navy military personnel are selected by FACSO from an updated BUPERS data file. All eligible other Service members and/or key civilians are supposed to be identified and added to the sample by local housing office staff. For housing complexes undergoing a census survey, all eligible personnel (including those from other Services and key civilians) are selected locally.

The FACSO sampling routines are applied separately for each of the six pay grade groups (see Chapter 1) at each complex undergoing a SAMS. The number of permanent party personnel entitled to BAQ with dependents is tabulated from dependency codes in the BUPERS file. An initial "sample factor" is then determined (see Table 3-1) on the basis of the number of those people whose deployment codes in MAGIC indicate that they will be available for the survey. The sample factor represents the selection interval; i.e., a sample factor of 10 means that every 10th person would be selected.

Multiplying the sample factor by the expected proportion available, FACSO generates a "weighted factor" that compensates for the unavailable population.

TABLE 3-1
INITIAL SAMPLE FACTORS

Number of BAQ-entitled personnel	Initial sample factor
1 to 75	1
76 to 250	2
251 to 400	3
401 to 550	4
551 to 700	5
701 to 900	6
901 to 1,100	7
1,101 to 1,300	8
1,301 to 1,450	9
1,451 to 1,600	10
1,601 to 1,800	11
1,801 to 1,900	12
1,901 to 2,050	13
2,051 to 2,200	14
Over 2,200	a

* Largest integer that will yield a sample size of at least 157.

Finally, since some selectees will not respond to the survey, FACSO divides the weighted factor by 1.5 to reflect an expected response rate of 67 percent. After adding 0.25, FACSO rounds the quotient down to the next integer (or up to 1 if it is less than 1.0). The resulting "compensated factor" ensures that the desired number of responses is actually received. Available personnel are sorted by name within each individual pay grade and are randomly selected at an interval equal to this compensated factor.

For example, at Guantanamo Bay in FY91 there were 859 E4 through E6 personnel in the BUPERS file entitled to BAQ with dependents; of that number, 799 were available for the survey. The sample factor was 6 (from Table 3-1); the weighted factor was $5.58[6(799/859)]$; and the compensated factor was

$3[(5.58/1.5)+0.25=3.97]$. Every third person in grades E4, E5, and E6 was selected, yielding a sample of 266 (799/3) Navy military personnel.

FY91 Results

In FY91, SAMS samples were initially drawn for 27 housing complexes. However, four of those complexes ended up conducting census surveys, and FACSO never received responses from a fifth. Table 3-2 presents FY91 statistics for the remaining 22 SAMS complexes. The data include additional samples selected for two complexes (see below), but exclude key civilians and other Service members since these personnel are identified and selected locally.

TABLE 3-2
FY91 SAMPLE SELECTION STATISTICS FOR SAMS COMPLEXES

Pay grade group	Total personnel^a	Entitled to BAQ	Available for survey	Selected for survey
O6-O10	864	807	693	693
O4-O5	5,708	5,017	3,870	2,548
W1-O3	15,172	8,546	5,674	3,427
E7-E9	18,815	17,530	12,924	5,070
E4-E6	110,040	70,295	49,385	7,059
E1-E3	50,397	11,116	7,124	4,232
All military	200,996	113,311	79,670	23,029

^a On 11/90 BUPERS file.

Over half (56 percent) of all military personnel at these complexes were entitled to BAQ at the "with dependents" rate, and 70 percent of those entitled to BAQ were expected to be available for the survey. The selectees represented 29 percent of the available personnel and 20 percent of the eligible personnel.

These statistics varied widely by pay grade. The proportion entitled to BAQ ranged from 93 percent for the O6–O10 and E7–E9 groups to 22 percent for the E1–E3 group. The proportion available for the survey ranged from 86 percent for the O6–O10 group to 64 percent for the E1–E3 group. The proportion (of those

available) selected for the survey ranged from 100 percent for the O6 – O10 group to 14 percent for the E4 – E6 group.

An additional 19 complexes conducted census surveys, although responses from one of these complexes were never received by FACSO. At the remaining 18 census complexes, 7,624 (60 percent) of the 12,751 total personnel in the BUPERS file were entitled to BAQ. That proportion ranged from 95 percent for the O6 – O10 group to 16 percent for E1 – E3 group. Data on actual sample sizes were not available for these complexes.

Other Findings

Additional Sampling

In order to reach response rate goals (discussed later in this chapter), some complexes have historically supplemented their initial samples with additional Navy personnel. In the past, these additions were often done locally, and some of the methods used were nonrandom. Where these additions did not represent all remaining eligible personnel, this process may have undermined the survey's validity.

Such practices have been sharply curtailed. NAVFAC authorized only two additional samples in FY91, and both were drawn randomly by FACSO. Another 307 E1 – E3 personnel were added to the initial 1,768 selectees at Charleston, and another 550 personnel (101 E7 – E9, 150 E4 – E6, and 299 E1 – E3) were added to the initial 1,991 selectees at San Diego.

Special Segments

Because of data constraints, the sample selection process does not ensure equal representation for all segments of the base-loading universe. One segment that is not well represented is ship-based personnel, who are often not available because they are deployed (nondeployed personnel are oversampled to compensate). However, survey results are analyzed by pay grade group, which accounts for any differences in the grade mix between ship- and shore-based units.

Furthermore, a special survey conducted by NAVFAC at Long Beach, Calif.,¹ demonstrated strong similarities between ship and shore personnel within the same pay grade groups. Ship personnel were more frequently separated from their families, but NAVFAC already makes appropriate adjustments at several complexes with large ship populations. No other ship-shore differences were statistically significant for more than one or two pay grade groups.

A second special segment is students. The student counts in the BUPERS file used for sampling can differ significantly from the annual on-board student averages used as base loading strengths. The number of students selected for the survey may therefore be substantially less (or more) than the number needed to make valid projections about the base loading universe.

A third special segment is other Service members housed at Navy complexes. They are not included in the BUPERS file, and thus are not included in the FACSO samples. Unless they are selected locally, they have no input to a process that directly affects them, and their characteristics and experience may not be accurately reflected by Navy data. Furthermore, by counting only Navy personnel in the sampling base, the process may not select enough people to make valid projections for certain pay grade groups or complexes.

On the other hand, it has been argued that personnel who are already living in military housing (and therefore do not need additional housing built or bought for them) should be excluded from the sample. Such individuals could be identified either by address or by virtue of having forfeited all (or at least most) of their BAQ. However, the number and bedroom requirements of involuntarily separated personnel living in military housing would still have to be determined (although that information could be estimated based on historical DD 1376/1377 data).

RESPONSE

Description

The NAVFAC survey guidelines published in January 1991 specify a response rate goal of 65 percent for each pay grade group at each housing complex undergoing

¹Respondents to this special survey, conducted in March – April 1991, included 465 shore-based personnel and 517 ship-based personnel; many of the latter were not available for the regular survey. Detailed results are presented in Appendix A.

a SAMS (85 percent at census survey complexes). This policy has created a perception that the survey is invalid if the response rate goal is not met. That perception is incorrect; lower response rates simply result in incrementally lower levels of accuracy and/or confidence.

When additional sampling occurs, confusion also exists over how to measure response rates and whether the goal should be applied to the original sample or to the combined sample. Although the overall response rate (based on the combined sample) is useful information, additional responses should be counted against the original sample when evaluating whether goals were met.

FY91 Results

Our discussion of FY91 results addresses only military personnel. Although 487 civilian responses were received (399 were accepted by the FACSO edit program), we have no way of knowing what proportion of all key civilians with families these numbers represent. All sampling of key civilians is done locally, and the relationship between the number of key civilian responses received and the key civilian strength reported on the "B" document is very weak. The combined history and current questionnaire data files include responses from 977 civilians at 28 complexes, but only four of those complexes reported key civilians (a total of 679) on their "B" documents.

Responses were received from 17,598 personnel (17,388 military, 206 civilian, and 4 unknown) at the 22 complexes undergoing a SAMS. The military respondents represented 76 percent of the 23,029 members selected from these complexes.² Although this exceeds NAVFAC's response rate goal of 65 percent, the goal was not met for several pay grades, as shown in Table 3-3.

The poor response from senior officers reflects problems at San Diego, where only 3 percent (13 of 381) of the O5 through O10 selectees responded. Excluding San Diego, the response rates would have been 100 percent for O8, 92 percent for O7, 88 percent for O6, 87 percent for O5, and 78 percent for all military personnel.

Response rates for the lowest officer and enlisted grades were also below the goal. Possible explanations include more frequent changes of location for these

²Military response rates may have been inflated by the inclusion of responses from other Service members (who were not included in the sample counts).

TABLE 3-3

FY91 SAMS MILITARY RESPONSE RATES BY GRADE

Pay grade	# Selected	# Received	Response rate (%)
O10	0	0	N/A
O9	1	1	100
O8	5	2	40
O7	22	11	50
O6	665	351	53
O5	878	689	78
O4	1,670	1,391	83
O3	2,152	1,807	84
O2	612	370	60
O1	293	190	65
W4	75	76	101
W3	116	115	99
W2	179	138	77
W1	0	2	N/A
E9	479	453	95
E8	1,111	1,017	92
E7	3,480	2,803	81
E6	2,879	2,344	81
E5	2,715	2,092	77
E4	1,465	1,343	92
E3	2,710	1,515	56
E2	1,237	584	47
E1	285	94	33
Total	23,029	17,388	76

Note: N/A = not applicable.

personnel (fewer are actually available for the survey), more frequent changes in rank (some may be counted in the higher grades' respondent totals), and/or less incentive to respond (fewer are eligible for family housing).

Table 3-3 shows very high response rates for warrant officers, in some cases exceeding 100 percent. This result may reflect additions to the sample by local housing office staff (new personnel, personnel designated by FACSO as unavailable, other service personnel, etc.) and/or changes in rank between the BUPERS file date

and the survey response date. However, none of those theories explains the presence of two W1 responses when nobody was supposedly selected from that pay grade.

In FY91, the SAMS response rates also varied by housing complex, as shown in Table 3-4 (number selected includes additional samples). Of the three complexes whose total military response rates were below 65 percent, additional samples had been drawn at two (Charleston and San Diego); for those complexes, total responses exceeded 65 percent of the initial sample size. The response rate of 102 percent for Dahlgren undoubtedly reflects the same phenomena noted above for warrant officers.

TABLE 3-4
FY91 SAMS MILITARY RESPONSE RATES BY COMPLEX

Complex	# Selected	# Received	Response rate (%)
Brunswick, Maine	995	773	78
New London, Conn.	1,602	1,181	74
Lakehurst, N.J.	311	252	81
Warminster, Pa.	519	450	87
Naples, Italy	662	536	81
Sigonella, Sicily	576	489	85
Pensacola, Fla.	1,112	925	83
Kings Bay, Ga.	892	781	88
Gulfport, Miss.	949	772	81
Charleston, S.C.	2,075	1,271	61
Great Lakes, Ill.	1,112	756	68
Glenview, Ill.	353	219	62
Long Beach, Calif.	1,513	1,171	77
Point Mugu, Calif.	670	541	81
Port Hueneme, Calif.	853	702	82
San Diego, Calif.	2,541	1,327	52
Lemoore, Calif.	1,007	844	84
Adak, Alaska	473	435	92
Bangor, Wash.	1,899	1,531	81
Whidbey Island, Wash.	1,419	1,100	78
Guam	1,135	965	85
Dahlgren, Va.	361	367	102
Total	23,029	17,388	76

Responses were received from another 7,592 personnel (7,310 military, 281 civilian, and 1 unknown) at the 18 census complexes. The military respondents represented 96 percent of all military personnel at those complexes identified by FACSO as eligible for BAQ, which exceeds NAVFAC's target of 85 percent. However, these response rates are suspect. Since census complex selectees were identified locally, the actual numbers may have differed from the FACSO statistics (response counts at several census complexes exceeded the BAQ totals computed by FACSO).

LOCAL PROCESSING

Description

A survey coordinator is designated at each participating SAMS or census complex. Blank questionnaires (along with selectee lists and preprinted mailing labels for SAMS complexes) are sent to each complex coordinator. The coordinator then usually forwards the individual packages (including instructions and franked return envelopes) to the selectees through their commanding officers, although in some cases selectees have been asked to fill out the questionnaires at their local housing office or another central location.

Completed questionnaires are returned to the complex coordinator, who edits each one to ensure that the answers are complete, logical, and legible. The coordinator is supposed to attempt to contact the respondents if any omissions or discrepancies are identified. The edited surveys are then sent to FACSO grouped in batches of 100 or less. Surveys associated with inspected units (see below) are batched separately.

Findings

We visited three housing complexes (Pensacola, Point Mugu, and Port Hueneme) and two EFDs (Southern and Western), met with NAVFAC headquarters staff, and analyzed FACSO data. We found a great deal of variation among complexes in how the survey was administered and in the quality and quantity of data collected.

As noted above, response rates varied widely by complex. Edit program rejection/correction rates also varied widely by complex. Some complexes contacted unit chiefs and commanding officers to maximize the number of surveys returned;

some edited the questionnaires more thoroughly than others; some were more consistent and conscientious than others in implementing the confirm/reverse inspection process (see below); and some complexes were also more careful than others in ensuring that FACSO received all batches.

The complexes that did a better job generally assigned more staff, more senior staff, and/or better trained staff to the survey. In some cases, those assignments reflected differences in workload or available resources, while in other cases they reflected differences in priorities. Some housing complexes are also inherently more difficult to survey because of their activity mix, their command structure, and/or their size.

Finally, most complexes do not keep copies of the questionnaires once they have been batched and mailed (although the forms are sent back to the complexes by FACSO after they are keypunched and edited). Batches that are lost en route are gone forever (as noted earlier, surveys from two complexes never reached FACSO). Furthermore, since coding problems identified by FACSO during the keypunch and edit processes cannot be resolved, additional data are lost.

FACILITIES SYSTEMS OFFICE PROCESSING

Description

At FACSO, each batch of questionnaires from the field is logged in, the data are keypunched (by contract employees), and each batch is run through a series of programs. Records are rejected if key data elements needed to determine housing eligibility/suitability are missing and cannot be inferred based on responses to related questions. If such inferences can be made, the records are retained and corrected. Other corrections randomly assign alternating values if less critical data elements are missing or invalid.

The edit program produces an output file with the accepted records and all corrections to those records. It also generates a report that counts the number of questionnaires processed, accepted, and rejected for each pay grade group; counts the number of rejection and correction conditions encountered by type; and lists all rejected or corrected questionnaire data.

Four supplemental variables are then calculated and added to each accepted record. The first is a code indicating which respondents had their claims of

unsuitability reversed on the basis of the local inspection process (see below); the second is the MAHC for the respondent's pay grade and location; the third is the required number of bedrooms based on the age and sex of all dependents; and the fourth is a housing suitability code based on survey data and program logic checks.

FY91 Results

About 4 percent (964 of 25,190) of all FY91 survey responses were rejected by FACSO edits. That rejection rate was between 3 percent and 6 percent for all military pay grade groups, and 18 percent for civilians. Complex-level rejection rates ranged from 0 to 15 percent; the three highest rejection rates occurred at two small OCONUS complexes and San Diego (incorrect coding of suitability on a large batch compounded the low response rate there).

Table 3-5 lists the specific rejection conditions and shows the number of occurrences of each condition. Because of multiple errors, the sum of all occurrences exceeds the total number of questionnaires rejected. These occurrence data may, in fact, be understated since the number of errors counted per questionnaire is capped at six. Most rejected questionnaires came from respondents who did not report their housing suitability or who simply did not qualify for family housing. The large number of respondents classified as single with no dependents may reflect child-support circumstances and/or outdated BUPERS codes.

Table 3-6 lists and describes the specific edit corrections, and shows the number of occurrences of each. The deletion of dependent spouses (discussed earlier) was new in FY91 and is not yet included in FACSO's standard edit reports. As with the rejection edits, the number of corrections may be understated because the number of changes counted per questionnaire is capped at six.

Other Findings

We visited FACSO several times, studied thousands of lines of program code and other documentation, reviewed standard and custom reports, and analyzed additional FACSO data. Although we found no serious flaws in how the survey data were processed, we believe that FACSO is doing many things without sufficiently understanding why and/or without NAVFAC sufficiently understanding how.

This lack of understanding reflects the distance (physical and organizational) between NAVFAC headquarters and FACSO and the length of time since the process

TABLE 3-5

AUTOMATED EDITING OF QUESTIONNAIRES: REJECTIONS

Description of rejection condition	Number of occurrences
Duplicate Social Security number	102
Pay grade (rank) field blank	5
Single with no dependents	315
Housing type field blank	83
Bedroom field blank	27
Cost field blank	14
Adequacy field blank	375
Reason for owning invalid	104
Mobile home unsuitability invalid	18

was first developed. Neither NAVFAC nor FACSO has the mandate or resources to be both technician and policy maker, and the complexity of this process necessitates a certain amount of specialization. In fact, the continued presence of key staff at both NAVFAC and FACSO has been instrumental in keeping the process from falling apart.

We also found some problems with data entry. Although we were assured by FACSO that the keypunching included verification, it is virtually impossible to enter 2 million characters of data without making some mistakes. In fact, some of the edit corrections noted in Table 3-6, such as age and sex data for dependents that were out of position by one column, were clearly triggered by keypunch errors. We found 64 FY91 pre-edit responses with invalid values that – whether caused by inadequate local editing or keypunch error – could have been caught by more rigorous data entry checks.

The FACSO edit reports are sent to the activities. However, because (as noted above) the activities rarely keep copies of the surveys and often do not know how to interpret these reports, the value of this information is limited. Meanwhile, the EFDs generally do not see the edit reports (and are unfamiliar with the their interpretation or use).

TABLE 3-6

AUTOMATED EDITING OF QUESTIONNAIRES: CORRECTIONS

Question	Description of correction	Occurrences
#5 (Pay grade)	If type (O/E/W/S/B) is valid but grade is missing/invalid, set grade to 01	2
#7 (Dependents)	If sex is invalid, set to alternating M/F; if age is invalid, set to alternating 06/10	23
#10 (Bedrooms)	If missing/invalid, assign using DoD rules based on age and sex of dependents	274
#6 (Married)	If missing/invalid, set to yes (2) if living with family, and set to no (1) otherwise	78
#8/#9 (Separation)	If missing/invalid and housing type is missing, set to alternating 2/3/4	148
#8/#9 (Separation)	If missing/invalid and housing type is valid, set to 1	503
#12 (Preference)	If missing/invalid, set to alternating 7/8/9	32
#13 (Distance)	If missing/invalid, set to 1	157
#14 (Travel time)	If missing/invalid, set to 2	94
#15 (Housing cost)	If missing/invalid, set to 0	137
Confirm/reverse	If invalid, set to blank	1
#7 (Dependents)	If below Grade E6 and between 18 and 46 years old, or if above Grade E5 and between 24 and 46 years old, delete (assumed spouse)	799

HOUSING SUITABILITY

Description

One of the most important uses of the survey is to estimate how many personnel living in private-sector units are unsuitably housed. Those personnel and others who are involuntarily separated from their families represent the current unmet requirement at a housing complex. Since the units currently occupied by personnel classified as unsuitably housed are not counted in the assets that are applied against future requirements, suitability rates also affect the future deficit.

The DoD has specified four basic criteria for determining the suitability of community (private-sector) housing. Travel to or from work cannot exceed 1 hour (by private auto) or 30 miles (NAVFAC historically defined over 29 miles as

unsuitable, but new DoD rules eliminate distance as a criterion); average costs cannot exceed the declared MAHC; the unit must have sufficient bedrooms for the age and sex of nonspousal dependents; and the utilities, equipment, structural condition, or neighborhood cannot be substandard.

The NAVFAC suitability determination process is summarized in Table 3-7. For each combination of responses to the relevant survey questions, the figure displays the housing suitability code assigned by NAVFAC and the proportion of FY91 postedit survey respondents falling into that category.

Involuntary separations do not have their suitability assessed (since they are automatically defined as requirements), while voluntarily separations and families living in military housing are all defined as suitable (effectively removing them from net requirements). Input documents are used to count any substandard military units. The distance criteria applies to all other personnel, but the cost, bedrooms, and condition criteria only apply to private unit renters plus those private unit owners who indicated on Question 17 that they were forced to buy to prevent family separation.

Service members must claim unsuitability for themselves. For example, respondents' housing cannot be classified as unsuitable because of cost unless the respondent checks cost on Question 16, even if the reported actual cost (Question 15) exceeds the MAHC. Similarly, respondents' housing cannot be classified as unsuitable because of too few bedrooms unless the respondents themselves check bedrooms on Question 16, even if their reported actual number of bedrooms (Question 10) is less than the calculated DoD requirement.³

Substandard housing is the trickiest suitability criterion. The conditions respondents consider to be acceptable vary widely. Reporting biases may also exist in both directions. NAVFAC therefore makes its local housing office staff physically inspect a proportion of any units identified by survey respondents as substandard. That proportion ranges between 1 to 7 and 1 to 2, based on the total number of responses for the pay grade group.

³The number of FY91 respondents classified as unsuitably housed because of cost and/or too few bedrooms would have more than doubled – from about 1,400 to about 3,200 – without this self-reporting constraint.

TABLE 3-7

NAVY FAMILY HOUSING SUITABILITY DETERMINATION

Status (Q8, Q9) ^a	Commute (Q13, Q14)	Type of housing (Q11, Q17)	Unsuitability (Q16)	Cost (Q15)	Bedrooms (Q10)	Program reversal	Suitability	FY91 survey frequency
Involuntary separation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.3%
Voluntary separation	N/A	N/A	N/A	N/A	N/A	N/A	Suitable (1) ^b	9.7
With family	Over 29 miles or over 60 minutes	N/A	N/A	N/A	N/A	N/A	Unsuitable (2)	4.9
(Same)	Under 30 miles and 60 minutes or less	Military	N/A	N/A	N/A	N/A	Suitable (1)	37.4
(Same)	(Same)	Own private (did not buy to prevent separation)	N/A	N/A	N/A	N/A	Suitable (1)	13.2
(Same)	(Same)	Own Private (bought to prevent separation) or rent private	None	N/A	N/A	N/A	Suitable (1)	18.4
(Same)	(Same)	(Same)	Cost	> MAHC ≤ MAHC	N/A N/A	N/A N/A	Unsuitable (4 - 8) Suitable (1)	3.3 2.4
(Same)	(Same)	(Same)	Bedrooms	N/A N/A	< Required ≥ Required	N/A N/A	Unsuitable (C) Suitable (1)	0.4 0.3
(Same)	(Same)	(Same)	Condition ^c	N/A N/A	N/A N/A	No Yes	Unsuitable (3) Suitable (1)	1.5 0.4
(Same)	(Same)	(Same)	Cost and bedrooms	> MAHC > MAHC ≤ MAHC ≤ MAHC	< Required ≥ Required N/A ≥ Required	N/A N/A N/A N/A	Unsuitable (C) Unsuitable (4 - 8) Unsuitable (C) Suitable (1)	0.2 0.2 0.3 0.3
(Same)	(Same)	(Same)	Cost and condition	> MAHC ≤ MAHC ≤ MAHC	N/A N/A N/A	N/A No Yes	Unsuitable (C) Unsuitable (3) Suitable (1)	0.7 1.5 0.4
(Same)	(Same)	(Same)	Bedrooms and condition	N/A N/A N/A	< Required ≥ Required ≥ Required	N/A No Yes	Unsuitable (C) Unsuitable (3) Suitable (1)	0.2 0.2 0.1
(Same)	(Same)	(Same)	Cost and bedrooms and condition	> MAHC > MAHC ≤ MAHC ≤ MAHC ≤ MAHC	< Required ≥ Required N/A ≥ Required ≥ Required	N/A N/A N/A No Yes	Unsuitable (C) Unsuitable (C) Unsuitable (C) Unsuitable (3) Suitable (1)	0.1 0.2 0.2 0.3 0.1

Note: N/A = not applicable.

^a Qxx denotes question number xx on DD Form 1376; relevant responses are shown in table cells for that column.

^b NAVFAC housing suitability codes: 1 = suitable; 2 = excess distance; 3 = substandard; c = substandard - cannot be reversed; 4 = excess cost < \$5; 5 = excess cost \$5 - \$10; 6 = excess cost \$11 - \$25; 7 = excess cost \$26 - \$50; 8 = excess cost > \$50.

^c Condition responses include incomplete utilities, structural condition, equipment, and/or neighborhood.

These inspections for substandard conditions either confirm or reverse the reported unsuitability of the housing. However, no units reported as suitable are inspected to see if they are actually unsuitable, in keeping with DoD and Navy policy regarding self-reporting of (un)suitability. The inspection results are recorded on the questionnaire (the suitability answers themselves are not changed), and are used by FACSO programs to reverse a comparable proportion of all responses claiming unsuitability because of condition alone (although confirmed responses cannot be reversed by the program).

For example, suppose that local housing officials determined that 5 out of 10 inspected units should have been classified as suitable, and that a total of 30 units were claimed by respondents to be unsuitable because of substandard conditions alone. The program would reclassify 15 [$30(5/10)$] of these respondents as suitably housed. This calculation is performed separately for each pay grade group at each complex.

FY91 Results

The units of 1,224 respondents who claimed to be unsuitably housed because of substandard conditions were inspected during FY91, and 421 (34 percent) of those claims were reversed. However, some of these units were subsequently rejected by the edit program and some were also unsuitable for other reasons. As a result, the FACSO programs ultimately reversed only 241 units that had been reported as unsuitable because of substandard conditions.⁴

These confirm/reverse results varied widely by complex. No inspected units were reversed at eight complexes, including La Maddalena, Italy (n=167), while all of the inspected units were reversed at four complexes, including London, England (n=58). Almost half of the program reversals occurred at four complexes: Bangor (40), Whidbey Island (29), Charleston (27), and Gulfport (21).

Overall, 14 percent of all FY91 survey respondents were classified by NAVFAC as unsuitably housed. However, an unsuitable classification is only possible for

⁴Multiplying the number of reversals for each complex and pay grade group by the ratio of total current BAQ-eligible personnel (from "B" documents) to total valid survey responses implies that this process reduced the total deficit at these 40 complexes by 1,872 units.

personnel living with their families in the private sector. The unsuitable rate for this subset of FY91 survey respondents was 28 percent.

Forms DD 1377 and 1378 show three categories of housing unsuitability: distance, cost only, and substandard conditions (including bedrooms). The data in Table 3-8 provide more detail and account for respondents with multiple reasons for unsuitable housing. Distance, cost, and condition were about equally important as reasons for unsuitability, with number of bedrooms the least commonly cited reason.

TABLE 3-8
FY91 UNSUITABLE HOUSING RATES BY REASON

Reason for unsuitability	Proportion of all respondents (%)	Proportion of applicable subset (%)
Excess distance	4.9	9.8
Excess cost	5.3	10.7
Too few bedrooms	1.4	2.8
Substandard condition	5.2	10.5
Total (all reasons)	14.0	28.3

Note: Percentages for four individual reasons may add to more than total percentage for all reasons because of multiple responses. Applicable subset refers to personnel living with their families in private-sector units.

Table 3-9 shows overall unsuitability rates for each pay grade in FY91. Enlisted personnel in lower grades were most likely to be unsuitably housed; supporting data show that excess cost, too few bedrooms, and substandard conditions were all more common for that group. Excess distance was more common among higher grades, probably reflecting the greater likelihood of such personnel owning homes and the greater choice associated with higher income levels. The unusually low unsuitability rate for all civilians is attributable to the low proportion of these respondents in the applicable subset (i.e., living off-post with their families).

Table 3-10 shows that the rate of unsuitable housing varied much more widely by complex. This variation reflects both the on-base/off-post mix and differences in local housing markets. Since personnel living in military housing are defined by

TABLE 3-9
FY91 UNSUITABLE HOUSING RATES BY PAY GRADE

Pay grade	Proportion of all respondents (%)	Proportion of applicable subset (%)
O10	N/A	N/A
O9	0.0	N/A
O8	0.0	N/A
O7	8.3	100.0
O6	13.6	24.5
O5	15.6	21.9
O4	13.5	20.4
O3	14.1	23.0
O2	12.0	22.3
O1	13.5	24.2
W4	14.4	21.0
W3	14.1	25.3
W2	15.8	38.0
W1	0.0	0.0
E9	12.5	20.7
E8	13.4	25.3
E7	14.3	29.0
E6	13.7	31.9
E5	12.3	32.1
E4	13.9	31.2
E3	21.0	36.0
E2	19.1	35.5
E1	18.7	37.8
Civilians	1.8	30.4
Total (all grades)	14.0	28.3

NAVFAC as suitably housed, complexes such as those at Adak and Guantanamo Bay where everyone lives in military housing had unsuitability rates of 0 percent.

Private sector housing prices are also important. Complexes near large cities (New York, Los Angeles, London, etc.) tended to have higher proportions of personnel paying too much for housing and/or higher proportions who must live too far away in order to find affordable housing. Finally, wide variations in the rate of substandard

TABLE 3-10

FY91 UNSUITABLE HOUSING RATES BY COMPLEX

Complex	Proportion of all respondents (%)	Proportion of applicable subset (%)
Brunswick, Maine	16.4	29.9
Winter Harbor, Maine	12.8	35.6
New London, Conn.	22.6	39.2
Ballston Spa, N.Y.	22.4	30.4
Lakehurst, N.J.	13.0	48.5
Warminster, Pa.	19.8	27.1
Sugar Grove, W. Va.	19.8	51.4
Chesapeake, Va.	22.7	34.3
Keflavik, Iceland	0.5	21.4
London, England	23.7	36.9
St. Magwan, England	14.3	50.0
Gaeta, Italy	31.6	33.3
Naples, Italy	33.3	45.1
Sigonella, Sicily	44.8	81.1
Lisbon, Portugal	63.6	65.1
La Maddalena, Italy	35.4	65.7
Rome, Italy	53.8	53.8
Pensacola, Fla.	8.6	11.7
Kings Bay, Ga.	19.4	25.6
Gulfport, Miss.	12.4	15.8
Beaufort, S.C.	14.3	25.0
Charleston, S.C.	9.3	12.1
Great Lakes, Ill.	13.1	25.3
Glenview, Ill.	25.1	44.5
Guantanamo Bay, Cuba	0.0	N/A
Roosevelt Roads, P.R.	7.7	31.6
Antigua	18.5	83.3
China Lake, Calif.	0.0	0.0
Long Beach, Calif.	14.7	27.2
Point Mugu, Calif.	13.4	30.5
Port Hueneme, Calif.	16.2	32.7
San Diego, Calif.	20.7	29.4
Lemoore, Calif.	6.1	13.6
Adak, Alaska	0.0	N/A
Bangor, Wash.	16.7	23.3
Whidbey Island, Wash.	13.5	18.5
Kauai, Hawaii	12.3	45.5
Guam	0.7	12.7
Dahlgren, Va.	16.9	37.3
Wallops Island, Va.	14.5	36.4
Total (all complexes)	14.0	28.3

housing suggest that differences in local housing markets appear to have been compounded by inconsistencies in the confirm/reverse inspection process.

SAMPLING ERROR

Description

The accuracy of NAVFAC's family housing deficit calculations is largely driven by the accuracy of the survey estimates (although it also depends upon the accuracy of base loading, private-sector assets and other inputs). Since the survey estimates are based on sample data, and since sample data always have an associated degree of error, it is important to assess the effect of sampling errors on the resulting requirements estimates.

Sampling error can be expressed in terms of a given level of confidence in a given level of accuracy. The levels of confidence and accuracy are intertwined; the same degree of sampling error can mean higher accuracy at lower confidence levels, or lower accuracy at higher confidence levels. The amount of error (E) depends upon the proportion being measured (P), the sample size on which the measurement is based (n), the size of the population to which the estimate is applied (N), and the t-statistic for the desired level of confidence (T).

The correct sample size (n) for the survey is the number of responses accepted by the edit program (not the initial sample size nor the total response count). The correct population size (N) is the BAQ count from base loading (not the BAQ count from BUPERS). Since requirements are calculated by pay grade group, sampling error must initially be calculated at that level. Thus, the following equation, which includes a finite population correction, is applicable to each pay grade group (i) within each complex (j):

$$E_{ij} = T \left[\left(P_{ij} \right) \left(1 - \left(P_{ij} \right) / n_{ij} \right) \right]^{0.5} \left[1 - \left(n_{ij} / N_{ij} \right) \right]^{0.5}$$

The complex-level proportions are weighted averages of the pay-grade-group-level proportions:

$$P_j = \sum_i P_{ij} \left(N_{ij} / N_j \right)$$

The complex-level errors are also weighted averages, but the weights are squared:

$$E_j = \left[\sum_i E_{ij}^2 \left(N_{ij} / N_j \right) \right]^{0.5}$$

FY91 Results

To isolate the effects of survey sampling error, we analyzed current gross military housing requirements (rather than the current or projected deficits, which are also affected by supply estimates). We excluded survey responses from civilians, since we did not have reliable data on the corresponding population. We also did not address bedroom composition since it did not affect gross requirements.

We calculated the combined proportion of unsuitably housed and involuntarily separated personnel (the two characteristics are mutually exclusive as defined by NAVFAC), the implied total housing requirement, and the associated sampling error (at the 95 percent confidence level), for 240 strata (6 pay grade groups at 40 complexes). We then used the aggregation formulas shown above to obtain complex subtotals and grand totals.

Table 3-11 summarizes our results. Since about 135,000 military personnel at these 40 complexes were eligible, our results imply that about 27,000 (20 percent) were either unsuitably housed or involuntarily separated. Because enlisted personnel in lower grades had higher separation/unsuitability rates, and because relatively fewer of these personnel were selected for (and responded to) the survey, the proportion of all eligible military personnel who are unsuitably housed or involuntarily separated is slightly higher than the corresponding proportion of survey respondents.

For ease of interpretation, we show sampling error in both absolute and relative terms. The absolute error equals the 90 percent confidence interval for the total proportion. The relative error expresses this absolute error as a percentage of the

TABLE 3-11
FY91 SAMPLING ERROR CALCULATIONS

Complex	Military population		Unsuitably housed or involuntarily separated			
	Survey responses	Total eligible	Survey proportion	Total proportion	Absolute error ^a	Relative error ^b
Brunswick	769	2,488	18.3%	18.9%	2.5%	13.1%
Winter Harbor	203	302	16.7%	20.2%	2.9%	14.2%
New London	1,147	6,784	25.0%	22.3%	2.3%	10.1%
Ballston Spa	780	890	23.1%	23.3%	1.1%	4.7%
Lakehurst	246	457	14.2%	14.4%	2.5%	17.6%
Warminster	435	1,411	22.3%	24.0%	3.4%	14.2%
Sugar Grove	91	87	24.2%	24.1%	0.0%	0.0%
Chesapeake	494	770	24.3%	24.3%	1.9%	7.9%
Keflavik	1,275	1,492	5.7%	5.7%	0.4%	7.1%
London	366	713	24.3%	23.0%	2.4%	10.2%
St. Magwan	55	65	14.5%	13.8%	2.7%	19.4%
Gaeta	174	286	31.6%	32.2%	3.9%	12.0%
Naples	523	1,988	34.2%	30.8%	3.6%	11.5%
Sigonella	478	1,651	45.8%	46.8%	3.9%	8.3%
Lisbon	44	72	63.6%	63.9%	6.0%	9.4%
La Maddalena	503	553	39.4%	39.1%	1.1%	2.8%
Rome	25	30	52.0%	63.3%	3.4%	5.3%
Pensacola	907	5,197	11.1%	11.3%	1.9%	17.1%
Kings Bay	764	3,285	22.9%	21.6%	2.6%	12.0%
Gulfport	742	2,254	14.8%	14.2%	1.9%	13.6%
Beaufort	189	256	15.9%	17.2%	2.7%	15.5%
Charleston	1,229	15,366	12.2%	13.5%	2.2%	16.0%
Great Lakes	740	4,119	17.2%	19.0%	3.0%	15.9%
Glenview	211	1,208	27.0%	22.3%	4.5%	20.0%
Guantanamo Bay	1,330	1,482	7.6%	7.8%	0.5%	6.2%
Roosevelt Roads	1,091	1,396	9.5%	10.5%	0.8%	8.0%
Antigua	27	46	18.5%	15.2%	6.9%	45.2%
China Lake	295	617	0.0%	0.0%	0.0%	0.0%
Long Beach	1,089	7,810	20.2%	19.3%	2.4%	12.2%
Point Mugu	537	1,512	17.9%	17.9%	2.6%	14.6%
Port Hueneme	681	2,056	23.5%	23.4%	2.4%	10.2%
San Diego	1,129	44,772	26.2%	25.7%	2.7%	10.6%
Lemoore	841	3,063	7.8%	7.7%	1.7%	21.4%
Adak	424	1,220	9.2%	9.8%	2.1%	21.5%
Bangor	1,481	8,991	19.7%	22.3%	2.4%	10.6%
Whidbey Island	1,062	4,991	14.1%	15.4%	2.1%	13.8%
Kauai	81	99	16.0%	17.2%	3.1%	17.9%
Guam	958	4,279	1.3%	1.9%	1.0%	51.8%
Dahlgren	356	446	19.4%	20.2%	1.7%	8.4%
Wallops	55	77	21.8%	24.7%	5.6%	22.6%
Average: SAMS	761	5,698	18.4%	20.4%	2.3%	11.2%
Average: All	596	3,365	17.5%	20.1%	2.4%	11.8%

^a 90 percent confidence interval for estimated total proportion.

^b Absolute sampling error (unrounded) divided by total proportion (unrounded)

total proportion. For example, NAVFAC can be 90 percent confident that the true total proportion for Brunswick is within 2.5 percent of the estimate, a relative error of 13.1 percent ($=2.5/19.0$). Both Lemoore and Dahlgren had absolute sampling errors of 1.7 percent, but the relative error was much higher for Lemoore (21.4 percent versus 8.4 percent) because of its lower total proportion.

The SAMS methodology was designed so the absolute sampling error would be no more than 6 percent at the 90 percent confidence level, assuming a true proportion of 30 percent. This translates into a relative error of 20 percent ($=6/30$). The selection process used by FACSO also assumes a response rate of 65 percent. Since the true proportion was lower (as can be seen from the formula, the absolute error decreases as the proportion approaches zero) and since the response rate was higher, the sampling error was below this target at 38 of the 40 complexes. The average absolute sampling error was 2.3 percent for SAMS complexes and 2.4 percent for all complexes. The relative sampling error, which averaged 11.2 percent for SAMS complexes and 11.8 percent for all complexes, exceeded 20 percent at several complexes.

On the basis of one year's results, it appears that the SAMS theory and its implementation are valid (with the caveats noted earlier). Since the underlying assumptions regarding the true proportion and the response rate turned out to be conservative, the actual sampling error was smaller than expected. Although the desired levels of accuracy and confidence are policy decisions (there are no universal standards), it is worth noting that the 90 percent programming factor used by NAVFAC (see Chapter 6) largely eliminates the effects of DD 1376 sampling errors.

CHAPTER 4

OTHER INPUTS

BACKGROUND

Aside from DD 1376 results, almost all of the personnel and housing data used in the requirements determination process must first be brought into MAGIC. In most cases, the EFDs enter and update these data through a series of input documents and associated on-line screens. They are stored in a series of files within MAGIC, and from there they are accessed by various FACSO programs.

PERSONNEL DATA

Input Documents

Current and projected personnel strength data for each housing complex come from base loading CPS (current personnel summary) and PPS (projected personnel summary) files. The data are brought into MAGIC using two input documents generated electronically by the baseloading programs:

- *Current Personnel Strengths* ("B" document)
- *Projected Personnel Strengths* ("J" document).

Both documents have the same basic format (the "B" document also includes total permanent party assigned by pay grade group), shown in Figure 4-1.

Separation Data

The results from DD Form 1376 are the only source of data on how many Navy personnel are voluntarily or involuntarily separated from their families. Since this number tends to be small and volatile at the housing complex level, NAVFAC uses a 2-year average separation rate for projections. FACSO uses each year's DD 1376 results to tabulate separations and retains those data within MAGIC as *Prior Year Separations* ("C" document) so that they can be combined with comparable data from the next year's DD 1376. Figure 4-2 shows the format of the "C" document.

1. Service Code: _____		2. Family Housing Complex: _____	
3. Complex Name and Location: _____			
4. Record Type: _____			
5. Officers:		7. Other enlisted:	
a. Total Strength	_____	a. Total Strength	_____
b. Permanent Party	_____	b. Permanent Party	_____
c. Permanent Party Authorized BAQ	_____	c. Permanent Party Authorized BAQ	_____
d. Students – More than 20 weeks	_____	d. Students – More than 20 weeks	_____
e. Students Above Authorized BAQ	_____	e. Students Above Authorized BAQ	_____
6. Eligible enlisted:		8. Civilians:	
a. Total Strength	_____	a. Total Strength	_____
b. Permanent Party	_____	b. Key Civilians	_____
c. Permanent Party Authorized BAQ	_____	c. Key civilians with families	_____
d. Students – More than 20 weeks	_____	9. Rank of personnel permanently assigned (Authorized BAQ): ["B" document only]	
e. Students Above Authorized BAQ	_____	a. O10 – O6	_____
		b. O5 – O4	_____
		c. O3 – W1	_____
		d. E9 – E7	_____
		e. E6 – E4	_____
		f. E3 – E1	_____

FIG. 4-1. "B" AND "J" DOCUMENT FORMAT

1. Service Code: _____	2. Family Housing Complex: _____
3. Complex Name and Location: _____	
4. Record Type: _____	
5. Authorized BAQ – Officers	_____
6. Authorized BAQ – Eligible Enlisted	_____
7. Number of families – Key Civilians	_____
8. Authorized BAQ – Ineligible Enlisted	_____
9. Voluntarily Separated – Officers	_____
10. Voluntarily Separated – Eligible Enlisted	_____
11. Voluntarily Separated – Key Civilians	_____
12. Voluntarily Separated – Ineligible Enlisted	_____
13. Involuntarily Separated – Officers	_____
14. Involuntarily Separated – Eligible Enlisted	_____
15. Involuntarily Separated – Key Civilians	_____
16. Involuntarily Separated – Ineligible Enlisted	_____

FIG. 4-2. "C" DOCUMENT FORMAT

Marriage Factors

The number of current Navy military personnel eligible for family housing (i.e., eligible for BAQ at the "with dependents" rate) can be determined from BUPERS data. However, BAQ-eligible numbers must be estimated for projected personnel. NAVFAC therefore multiplies projected permanent party strengths by the appropriate ratio of eligible personnel to total personnel; these ratios are called marriage factors.

The marriage factors applied to the projected personnel ("J" document) data are averages of the previous 3 years' actual ratios for current personnel at each complex. These ratios are calculated each year when the "B" document is generated, with

separate factors for each personnel category on this document, and are stored on tape by FACSO for future use; the averages are updated annually.

BAQ eligibility for other Service personnel are either provided by each activity or calculated based on the worldwide Navy average for the appropriate activity type. Finally, BAQ eligibility for projected personnel on activity type summaries and other base loading reports is estimating using current (1-year) marriage factors. These factors are available by individual UIC for all pay grade groups on the CPS, and can be aggregated as necessary.

Bedroom Factors

Family housing requirements must be calculated separately for each bedroom category, since Navy families are entitled to different numbers of bedrooms depending upon their pay grade and family composition. The bedroom mix of all current and projected housing assets can be derived from activity reports, DD 1376 data, market analyses, or other sources. The bedroom mix of current requirements is derived from DD 1376 data.

However, the bedroom distribution of future housing requirements must be estimated, since the family composition of future service members is not known. Bedroom factors (the proportions of personnel who will require 1-2, 3, or 4+ bedrooms) are therefore calculated by FACSO for each pay grade group using worldwide DD 1376 data and are then brought into MAGIC electronically.

Maximum Allowable Housing Costs

The monthly MAHC – the maximum amount that a service member should have to pay for housing each month in the private community – is defined as the sum of the Service member's BAQ, VHA, and out-of-pocket expenses. BAQ varies by pay grade and family composition (the BAQ with dependents rate is used for family housing purposes); VHA varies by pay grade and location; and out-of-pocket expenses are currently defined as 30 percent of the national median housing cost for each pay grade. In most cases, a Service member paying more than the appropriate MAHC is considered under DoD standards to be unsuitably housed (subject to the self-reporting and ownership-reason restrictions discussed in Chapter 3).

Out-of-pocket expenses and BAQ are entered directly into the FACSO programs (from data provided by DoD and NAVFAC), while the VHAs for each grade and

complex are entered into MAGIC by the appropriate EFD. These pieces are added to produce an MAHC for each complex and pay grade. Table 4-1 shows the minimum, average, and maximum MAHC by grade for military and civilian respondents to the FY91 survey.

HOUSING ASSET DATA

Housing asset data come from housing utilization reports, housing office referrals, MILCON reports, real estate listings, newspaper ads, market analyses, local governments, and other sources. Eleven input documents are used to enter the data into MAGIC. Eight of those documents address military housing units:

- *Military Housing Inventory* ("F" document)
- *Military Occupancy/Vacancy* ("G" document)
- *Redesignation of Existing Units* ("K" document)
- *MILCON Units Under Contract* ("L" document)
- *MILCON Units Approved* ("M" document)
- *Long Range Leased Units* ("N" document)
- *Current Leased Units* ("O" document)
- *Substandard Military Units Occupied* ("P" document).

The other three documents address private-sector housing units:

- *Available Vacant Private Rental Housing* ("D" document)
- *Available Vacant FHA/VA Rental Housing* ("E" document)
- *Under Construction/Firmly Planned* ("Q" document).

The "D", "E", "K", "L", "M", "N", "O", "P", and "Q" documents all have the same basic format, which is shown in Figure 4-3. The "E" document also includes two cells for military preference housing occupied by enlisted personnel. Figures 4-4 and 4-5 show the formats of the "F" and "G" documents, respectively. All of those documents are currently entered manually, but NAVFAC and FACSO are in the process of trying to automate the "F" and "G" documents.

TABLE 4-1

FY91 MAXIMUM ALLOWABLE HOUSING COST DATA

Pay grade	Number of personnel	Minimum MAHC (\$)	Average MAHC (\$)	Maximum MAHC (\$)
E1	91	449	610	1,070
E2	602	437	575	1,070
E3	1,565	437	575	1,070
E4	2,100	490	658	1,553
E5	3,996	560	744	1,504
E6	4,154	625	826	1,577
E7	3,513	676	940	1,805
E8	1,244	761	1,027	1,722
E9	535	761	1,007	1,722
W1	3	927	1,269	1,952
W2	171	680	1,043	1,997
W3	135	758	1,062	2,118
W4	90	872	1,162	2,454
O1	230	591	884	1,509
O2	400	680	953	1,997
O3	2,131	758	1,059	2,118
O4	1,601	872	1,206	2,454
O5	836	1,058	1,445	2,720
O6	413	1,115	1,494	2,935
O7	12	1,260	1,423	2,478
O8	3	1,260	1,361	1,563
O9	1	1,260	1,260	1,260
O10	1	1,260	1,260	1,260
WB1	2	490	490	490
WB6	123	625	625	625
GS1	1	490	490	490
GS5	2	625	625	625
GS7	164	758	758	758
GS12	104	872	872	872
GS15	3	1,115	1,115	1,115
Total	24,226	437	891	2,935

1. Service Code: _____		2. Complex Code: _____	
3. Complex Name and Location: _____			
4. Document: _____			
5. Grand total (total columns 6, 7, and 8): _____			
		6. 1 - 2 bedrooms	7. 3 bedrooms
			8. 4 or more bedrooms
a. Officers	(O10 - O6)	_____	_____
b.	(O5 - O4)	_____	_____
c.	(O3 - W1)	_____	_____
d. Enlisted	(E9 - E7)	_____	_____
e.	(E6 - E4)	_____	_____
f.	(E3 - E1)	_____	_____
g. Key Civilians	(Off)	_____	_____
h. Key Civilians	(Enl)	_____	_____

FIG. 4-3. "D", "E", "K", "L", "M", "N", "O", "P", "Q" DOCUMENT FORMAT

Findings

Utilization

One indicator of the importance of the input documents is their frequency of use. Table 4-2 shows how many of the 129 Navy complexes represented in MAGIC completed each document and how many of those completed documents were zero-filled. Not surprisingly, given their key role in the process and the fact that they are automatically generated, the three personnel asset documents ("B", "C", and "J") are almost universally used.

However, Table 4-2 has mixed results for the 11 housing asset documents. On the military side, most complexes reported inventory, occupancy/vacancy, and any redesignation of current units ("F", "G", and "K" documents), but significantly fewer utilized the other documents ("L", "M", "N", "O", and "P"). On the private side, many complexes reported currently available units ("D" document), but only a handful reported FHA/VHA or future units ("E" and "Q" documents). We are also concerned that only 45 CONUS housing complexes had "D," "E," or "Q" documents, yet

72 CONUS housing complexes had personnel living off post (according to the most recent DD 1376 data).

The high numbers of zero-filled input documents result in unnecessarily large files (increasing system response times). More important, the requirements themselves can also be distorted since some DD 1378 calculations use different inputs depending upon the presence or absence of certain documents.¹ This phenomenon reflects the complicated (and antiquated) nature of the MAGIC software. As noted earlier, changes must be posted in the form of transactions, and zeroing out the entries on a document does not automatically delete it from the system.

Other

Base loading separates personnel into one of two categories: a family housing requirement or a bachelor housing requirement. This classification is the basis for the "B" and "J" documents, which provide strength data for both bachelor and family housing. Often, the "B" and "J" documents are changed by activity or EFD personnel after the final base loading reports have been run. Since the base loading data (and resulting bachelor housing reports) are not updated each time these documents are changed, the sum of family and bachelor strengths used to generate requirements do not necessarily reconcile with base loading totals. Failure to update base loading also means that the changes are not incorporated into the following year's initial "B" and "J" documents and must be made again.

We also found several problems associated with the military asset documents. Since the "F" document has no fields for civilians, misleading DD 1377 results can occur at complexes with key civilians living in military quarters. Differences between the designated ("F") and occupied ("G") pay grade mix can also distort the DD 1377 results, and those distortions are exacerbated by the fact that the total number of units reported on the "F" and "G" documents – which should be identical, even if the grade mix is not – differed at 18 of the 99 Navy complexes with five or more military units.

Another issue is that there is no place to officially designate units currently being rehabilitated (although the "K" document can be used for that purpose).

¹In the July 1991 MAGIC file, we found no instances of zero-filled "K" documents that would have overwritten valid "F" document data, but we found one instance (Pensacola) of a zero-filled "P" document that overwrote valid "G" document data.

1. Service Code: _____	2. Complex Code: _____		
3. Complex Name and Location: _____			
4. Document: _____			
5. Total Inventory: _____			
a. Public Quarters	_____		
b. Leased	_____		
c. Substandard	_____		
d. Wherry	_____		
e. Rental Guarantee	_____		
6. Inventory by designation (Sum of 5 a through 5e). Include substandard units leased or current or anticipated occupancy			
	(1) 1 - 2 bedrooms	(2) 3 bedrooms	(3) 4 or more bedrooms
a. Officers (O10 - O6)	_____	_____	_____
b. (O5 - O4)	_____	_____	_____
c. (O3 - W1)	_____	_____	_____
d. Enlisted (E9 - E7)	_____	_____	_____
e. (E6 - E4)	_____	_____	_____
f. (E3 - E1)	_____	_____	_____

FIG. 4-4. "F" DOCUMENT FORMAT

Furthermore, the "G" document does not have bedroom breakdowns, since they are not shown on the underlying report (DD 1411 - Family Housing Inventory Designation and Assignment). If designation ("F") and utilization ("G") differ significantly, a complex must therefore either assume that the bedroom breakdown shown in the "F" document is still valid or use the "K" document to enter a new bedroom breakdown (which must be estimated).

Finally, we are concerned that the numbers of units reported on the "D" and "Q" documents understate the potential supply of (additional) private housing. As noted in Table 4-2, only 61 of 129 complexes reported any vacant private units (a total of 3,493 worldwide), and only 12 reported any private units under construction or firmly planned (a total of 3,111 worldwide).

1. Service Code: _____	2. Complex Code: _____				
3. Complex Name and Location: _____					
4. Document: _____					
5. Total Vacant Adequate (a through c): _____					
a. Public Quarters	_____				
b. Leased	_____				
c. Military Sponsored	_____				
d. Substandard	_____				
	Owned	Occupied Leased	Housing Sponsored	Inadequate	10. Vacant Adequate
6. Officer	_____	_____	_____	_____	_____
7. Eligible enlisted	_____	_____	_____	_____	_____
8. Other enlisted	_____	_____	_____	_____	_____
9. Key civilians	_____	_____	_____	_____	_____
11. Total Adequate Occupied units	_____	_____	_____	_____	_____

FIG. 4-5. "G" DOCUMENT FORMAT

The figures in these two documents are the result of multiplying the relevant market area total by the Navy's expected share (usually defined as the ratio of Navy to total households). We believe that the market areas totals are often incomplete, since it is almost impossible to contact all of the relevant data sources for vacant private units and since uncertainty about the status and composition (cost and bedroom mix) of units under construction or firmly planned means that some projects are probably omitted.

We also believe that the Navy's share, whether estimated locally or obtained from a market analysis, is often too low. The denominator can include households outside the market area or otherwise not in competition for vacant/new units, and the lack of detail by cost, size, or tenure (see Chapter 5) is also a problem.

TABLE 4-2
FY91 INPUT DOCUMENT UTILIZATION

Document	Total completed	Zero-filled
B	129	3
C	112	2
D	110	49
E	96	87
F	115	11
G	113	9
J	129	0
K	97	8
L	85	74
M	85	74
N	91	67
O	90	71
P	96	78
Q	84	72

Note: Based on 129 housing complexes.

CHAPTER 5

MARKET ANALYSIS

DESCRIPTION

Background

NAVFAC views community assets as the primary source of housing for Navy families. Of the 236,000 suitable housing assets projected on the DD 1378 to be available to Navy families throughout the world 5 years from now, almost two-thirds (150,000) are not under military control. The Family Housing Market Analysis (FHMA) is a process the Navy uses to quantify the degree to which projected family housing requirements at a complex will be satisfied by the community. It can also be used to verify abrupt changes in the community's ability to provide housing, and it can help assess the impact of major changes in Navy personnel strength and/or housing assets.

A recent (within the past 3 years) FHMA is required in support of any programming requests at locations in the United States and its possessions. The EFD is responsible for selecting locations, acquiring the studies, and interpreting the results. FHMAs are usually performed by a private appraisal, real estate consulting, or market research firm; the typical cost ranges from \$15,000 to \$25,000, and the typical completion time is 90 days. NAVFAC generally initiates fewer than 10 FHMAs each year.

Methodology

The basic FHMA output is a projection of how many suitable private housing units will be available to Navy families in 5 years. These projections must be broken down by pay grade group (based on cost) and by size (number of bedrooms). In many FHMAs, the projections are combined with data (furnished by the Navy) on requirements and military housing assets to generate an estimate of the projected housing deficit, a projection that may not agree with DD 1378 results.

To project total private housing supply, the FHMA must take into account current inventory, new construction, vacancy rates, price/cost considerations, suitability criteria, qualitative and quantitative demand factors, and any other market influences. To project the Navy-specific private housing supply, the FHMA must also take into account DoD suitability criteria, military pay and allowances (current and projected), market area definitions, and market share estimates.

The Navy furnishes the FHMA contractor with a statement of work, suitability criteria, local MAHC tables, DD 1376 findings, and current and projected data on military personnel strengths, military housing assets, and military pay and allowances. The FHMA report is generally organized into four major sections: market area description, current and projected supply conditions, current and projected demand conditions, and summary analysis and conclusions. An executive summary is required and one or more appendices may also be included.

NAVFAC is currently addressing several issues relating to the FHMA methodology. Among those issues are the determination of when studies should be performed (or updated), the appropriate length of the projection period, improved methods for calculating market share, the specification of data sources and definitions, the elimination of superfluous information, and the standardization and automation of outputs.

FINDINGS

We studied a sample of five recent FHMAs, reviewed generic and specific statements of work, and discussed the subject with headquarters and EFD personnel. We also collected and analyzed housing-related data from Federal sources. We found that given the limited amounts of time and money allotted and the difficulty in preparing accurate, detailed, long-term projections about housing markets, the FHMAs were of reasonably high quality. However, we have some concerns about the underlying methodology.

Sample Studies

We reviewed recent FHMAs for five Navy and Marine Corps housing complexes:

- Beaufort, N.C. (prepared by Mecklenburg Associates, Jacksonville, Fla., in 1990)

- Bangor/Bremerton, Wash. (prepared by McClelland Consultants, Bellevue, Wash., in 1991)
- Camp Pendleton, Calif. (prepared by Lauren Associates, Citrus Heights, Calif., in 1991)
- Twentynine Palms, Calif. (prepared by Lauren Associates, Citrus Heights, Calif., in 1990)
- Pensacola, Fla. (prepared by Pennoni Associates, Haddon Heights, N.J., in 1991).

While these studies do not represent a large enough sample to make statistically significant inferences, we believe that they allow us to draw meaningful general conclusions. That belief is strengthened by the diversity of the market areas. For example, the total private housing stock at these five locations ranged from 15,000 to 132,000 units; on-base housing was expected to satisfy anywhere from 17 to 41 percent of total demand; and deficits were expected to vary from 17 to 88 percent of total off-post demand.

Effects of Housing Allowances

The variation in off-post housing availability at these five locations suggests that the current housing allowance structure may not be equitable. In particular, MAHC differentials do not fully reflect differences in the cost of housing. The range in actual housing costs at these areas far exceeded the range in MAHCs, and some areas with higher housing costs (as determined by the FHMA's) had lower MAHCs.

For example, the studies found that two-bedroom apartment rents were 48 percent higher in the Camp Pendleton area than in the Pensacola area (\$675 versus \$455), but the E9 MAHC was only 24 percent higher (\$977 versus \$786) and the E5 MAHC was only 40 percent higher (\$787 versus \$561). At Beaufort, meanwhile, two-bedroom apartment rents were lower than those at Pensacola (\$389 versus \$455) even though the MAHC was higher for all pay grades.

Composition of Off-Base Housing Demand

The studies found that most of the deficits at the five sites were concentrated in pay grades E1 through E5. At the same time, most of the private-sector units required were one- or two-bedroom apartments (very few detached homes have only one or two bedrooms). This proportion ranged from 55 percent at Bangor/Bremerton

to 87 percent at Beaufort. This need for 1-2 bedroom off-post units stems both from their relative scarcity on base and from the smaller average family size of lower enlisted personnel. One reason for this scarcity is that the Navy has historically – and understandably – tended to build larger units, which can satisfy a wider range of requirements.

Public Housing

Public housing represented 3 percent or less of total private-sector housing at these five locations. Given current eligibility requirements and other limitations, very few military personnel reside in public housing (hence the scarcity of “E” documents noted in Chapter 4). Public housing is not a realistic alternative for military personnel unable to afford housing at market rates. In fact, the latest DD 1378 projects that only 17 FHA and VA rental units will be available to Navy families worldwide in 5 years.

Market Share

Calculation

A key part of the FHMA is determining what proportion of all suitable private housing units will be available to Navy families. As noted in Chapter 4, this market share (also known as the penetration rate or military fair share) is also used in the “D” and “Q” documents. NAVFAC accepts several different calculation methods for market share. Because the local market areas were so different, we were not surprised to find that effective market shares varied widely in the five sample FHMAs. However, we suspect that this variation also reflects methodological inconsistencies (although the studies provided little documentation on that subject).

Many factors affect market share: how the market area is defined, what specific data elements are used, how affordability and suitability are treated, how supply and demand are segmented, assumptions about vacancy rates and new construction, assumptions about local economic and demographic trends, and a host of other considerations. Changes to any of these factors can significantly alter the results.

Level Of Detail

We found that the same market share was usually applied to all suitable units, regardless of their cost, size, or tenure (renter versus owner). Although it is not

practical to calculate a separate share for every combination of these variables, we believe that some differentiation is both feasible and desirable.

The Navy should generally have a higher share of rented units than of owned units since the proportion of Navy families who rent is double the national average. In 1988, only 22 percent of all U.S. households headed by married couples in 1988 rented,¹ while 46 percent of all Navy families living in private housing were renters.²

The Navy should generally have a higher share of low cost units than of high cost units. Relatively few Navy families can afford expensive housing, given military pay and allowances, the decline in relative military earnings, distance restrictions, and military family sizes.

The Navy may also tend to have a higher share of large (3+ bedroom) units than of small (1-2 bedroom) units. While 3+ bedroom units only comprised 20 percent of the total private rental supply in San Diego in 1986,³ they represented 37 percent of the Navy's off-post demand. Similarly, 4+ bedroom units only comprised 4 percent of the total rental supply but represented 13 percent of the Navy's off-post demand.

Future Share

We found no accounting for the effect that projected changes in underlying market conditions would have on future market share. While such adjustments are difficult and partly subjective, these changes must clearly be accounted for, particularly in view of plans for base closures and realignments and force reductions. Applying the current share to future housing assets could bias the results in either direction, although the use of trends (i.e., multiple years of data) would reduce this bias.

One of the most important factors not being reflected in the market share is future changes in affordability. For the United States as a whole during 1984-1989, average earnings per military worker declined from 71 to 68 percent of average

¹U.S. Department of Commerce, Bureau of the Census, *Household and Family Characteristics*, March 1988.

²DD 1377 - *Tabulation of Family Housing Survey, CONUS Summary*, January 1989.

³U.S. Department of Commerce, Bureau of the Census, *American Housing Survey - San Diego Metropolitan Area*, September 1986.

earnings per private-sector worker.⁴ During the same period, prices of existing one-family homes sold rose by 28 percent⁵ while the income of military personnel increased only 19 percent. Both the increase in housing prices and the decrease in relative military earnings have been greater in California, which has a large Navy population.

Data from DD 1377 show that reduced affordability has already had an effect on both housing tenure and housing quality. The proportion of Navy families living off-base at CONUS installations who own their units dropped from 55 percent in late 1986 to 51 percent in early 1991. Furthermore, the proportion of renters at CONUS installations classified as unsuitably housed only because of excess cost has increased over the same period from 7 percent to 10 percent.

Although these proportions varied widely among individual complexes, the data clearly suggest a pattern. If these trends continue, even ignoring the wide swings in local housing market conditions that many areas have experienced, the Navy shares will inevitably change (at least for certain segments and markets). NAVFAC's current inability to incorporate such future changes into the analysis is a problem, particularly given the relative infrequency with which FHMAs are usually updated.

Suitability

In theory, all housing units whose cost exceeds the MAHC are unsuitable according to DoD criteria. However, many Navy families have other sources of income (about half of all military spouses work) or wealth (including gains from sales of previously owned housing), and can afford more expensive housing. Unless the FHMA relaxes this criterion to account for income/wealth effects (by increasing the total private assets, suitability rates, or market share), it will understate suitable private assets available to the Navy and overstate the deficit.

The methodology used by NAVFAC to generate DD Forms 1377 and 1378 (see Chapter 6) partly offsets the effects of this phenomenon since excess cost must be self-reported and since the cost criterion is not applied to many homeowners. As

⁴U.S. Department of Commerce, Bureau of Economic Analysis, *Regional Economic Information System*, 1991.

⁵U.S. Department of Commerce, Bureau of the Census, *Statistical Abstract of the United States - 1991*, Table 1275.

noted in Chapter 3, these two checks significantly reduce the number of private units classified as unsuitable. On the other hand, some units that are classified unsuitable for their present occupants because of excess cost and/or insufficient bedrooms may be suitable for other Navy families. The use of (un)suitability rates as currently defined may therefore understate available private assets and overstate the deficit.

Accuracy

The accuracy of the FHMAs is still unknown. Some forecasting error is unavoidable, particularly given the required level of detail, lengthy projection period, and nonstandard market areas. Past a certain point it also may not be cost-effective (in view of the other sources of uncertainty in the requirements determination process) to reduce FHMA error.

However some of our findings about the biases and weaknesses inherent in the current methodology lead us to suspect that FHMA error rates may be unnecessarily high. This suspicion is reinforced by our finding (noted in Chapter 4) that many housing complexes with personnel living off post do not report any vacant or planned new private housing on the MAGIC input documents.

One way to check accuracy would be to compare current private housing supply data (and also possibly current market share data) with FHMA projections from 5 years ago. Unfortunately, we found no evidence that NAVFAC or the EFDs make such comparisons, and we did not study any FHMAs old enough to permit such an analysis.

Miscellaneous

We have four other minor concerns about FHMAs. First, we believe that extraneous information is collected. Data on such topics as climate, history, geology, culture, etc., have no bearing on the analysis or the results, and their collection depletes the already limited time and resources available for the study.

Second, variations in format make it more difficult for NAVFAC to utilize the results or compare different studies. For example, three studies used enlisted pay grade groups of E1 through E3, E4 through E6, and E7 through E9, while the others used E1 through E3, E4 through E5, and E6 through E9. In addition, length of

service assumptions used to determine base pay either were not specified or were different among studies.

Third, all the sample studies assert that during the next 5 years (beginning in 1990) total housing demand will greatly exceed supply, which is clearly not a stable condition. In fact, many housing markets at this time appear to have the opposite problem (excess supply). We believe that these FHMAs may have underestimated the ability of market forces to compensate for excess demand through new construction, higher prices, and/or lower population growth.

Finally, we feel that the current FHMA methodology includes some inefficient and potentially counterproductive duplication of effort. We see no reason for FHMAs to calculate deficits since NAVFAC has the latest data on military strengths and military housing assets. Similarly, we see no reason for FHMAs to conduct small personnel surveys (as some do) at complexes that have had a more rigorous survey using the DD 1376.

CHAPTER 6

CALCULATIONS AND OUTPUTS

DESCRIPTION

All of the data discussed in the preceding chapters are used to determine the location (complex), size (number of units), and composition (grade and bedroom mix) of any family housing deficits. In this chapter, we discuss the requirements determination process itself, focusing on the key Department of Defense forms.

The first form generated by FACSO for NAVFAC is the raw data DD 1377, which displays a partial picture of the current family housing situation at each complex. Current requirements come from the "B" document (described in Chapter 4); sample data on separation and suitability come from the DD 1376 tabulations; sample data on current occupied private units (including owned/rented and bedroom distributions) also come from DD 1376 tabulations; data on current occupied military units come from the "F" and "G" documents; and data on current vacant military and private units come from the "D", "E", and "G" documents.

The second form is the DD 1377 (Figure 6-1), which displays a complete picture of the current housing family situation at each complex. In this form, the sample (DD 1376) results are extrapolated to reflect the total current (base loading) population; that extrapolation is performed separately for each pay grade group and bedroom category. The format and data sources are virtually the same as for the raw data DD 1377, except in the latter the requirements column for Lines 66-113 is split into two parts (on post and off post), and the off-post assets column for the same lines is also split into two parts (occupied and vacant).

The third form is the DD 1378 (see Figure 6-2; Lines 24-54 of that form address project composition and are not generated by FACSO), which displays a complete picture of the projected (5 years ahead) family housing situation at each complex. Projected requirements are generated by applying 3-year marriage factors, DD 1377 separation rates, "B" document pay grade distributions, and worldwide bedroom factors to projected strength data from the "J" document. Projected military assets equal current military assets (from the "F" and "G" documents) plus any changes

	Officers A	Eligible enlisted B	Key civilians C	Subtotal (A + B + C) D	Other enlisted E	Total (D + E) F
1. Date of survey____ Run date____						
Requirements						
2. Total personnel strength						
3. Permanent housing strength						
4. Number of families						
5. Housing requirements factor						
Not living with family – status of housing						
6. Not living with family						
7. Involuntarily separated families						
8. Prefer military quarters						
9. Prefer private housing						
10. Voluntarily separated families						
Living with family in area						
11. Living with family in area						
12. Suitably housed						
13. In military controlled housing						
14. Prefer renting off post						
15. Prefer owning off post						
16. In private housing						
17. Prefer military quarters						
18. Prefer renting off post						
19. Unsuitably housed						
20. In military controlled housing						
21. Prefer renting off post						
22. Prefer owning off post						
23. In private housing						
24. Prefer military quarters						
25. Prefer renting off post						
26. Excess distance						
27. Substandard						
28. Excess cost only over MAHC						
29. Less than \$5						
30. \$5 to \$10						
31. \$10 to \$25						
32. \$25 to \$50						
33. \$50 and more						

FIG. 6-1. DD FORM 1377 – TABULATION OF FAMILY HOUSING SURVEY

	Officers A	Eligible enlisted B	Key civilians C	Subtotal (A + B + C) D	Other enlisted E	Total (D + E) F
Owned						
34. In owner occupied houses						
35. Suitable in all respects						
36. Unsuitable						
37. Excess distance						
38. Substandard						
39. Excess cost only						
40. In owner occupied trailers						
41. Suitable in all respects						
42. Unsuitable						
43. Excess distance						
44. Substandard						
45. Excess cost only						
Rented						
46. In rented housing off post						
47. Suitable in all respects						
48. Unsuitable						
49. Excess distance						
50. Substandard						
51. Excess cost only						
Military						
52. In military controlled housing						
53. Adequate as public quarters						
54. Military owned						
55. Military leased						
56. Military sponsored						
57. Inadequate as public quarters						
Vacant housing						
58. Vacant housing						
59. Private rental housing						
60. FHA & VA held rental housing						
61. Military housing adequate as public quarters						
Inspected results						
62. Number of unsuitable units inspected						
63. Number of inspected units reclassified						
64. Adjustment factors						
65. Name and location of installation						

FIG. 6-1. DD FORM 1377 – TABULATION OF FAMILY HOUSING SURVEY (Continued)

	Effective requirements		Suitable housing			Deficit (A - E)
	Number	Percent	Military control	Off post	Total (C + D)	
	A	B	C	D	E	
66. O10 through O6						
67. 1 and 2 bedrooms						
68. 3 bedrooms						
69. 4 or more bedrooms						
70. O5 through O4						
71. 1 and 2 bedrooms						
72. 3 bedrooms						
73. 4 or more bedrooms						
74. O3 through O1 and W4 through W1						
75. 1 and 2 bedrooms						
76. 3 bedrooms						
77. 4 or more bedrooms						
78. All officer grades						
79. 1 and 2 bedrooms						
80. 3 bedrooms						
81. 4 or more bedrooms						
82. E9 through E7						
83. 1 and 2 bedrooms						
84. 3 bedrooms						
85. 4 or more bedrooms						
86. E6 through E4						
87. 1 and 2 bedrooms						
88. 3 bedrooms						
89. 4 or more bedrooms						
90. All eligible enlisted						
91. 1 and 2 bedrooms						
92. 3 bedrooms						
93. 4 or more bedrooms						
94. All eligible military						
95. 1 and 2 bedrooms						
96. 3 bedrooms						
97. 4 or more bedrooms						
98. Key civilians - O equivalent						
99. 1 and 2 bedrooms						
100. 3 bedrooms						
101. 4 or more bedrooms						

FIG. 6-1. DD FORM 1377 -- TABULATION OF FAMILY HOUSING SURVEY (Continued)

	Effective requirements		Suitable housing			Deficit (A - E) F
	Number A	Percent B	Military control C	Off post D	Total (C + D) E	
102. Key civilians -- E equivalent						
103. 1 and 2 bedrooms						
104. 3 bedrooms						
105. 4 or more bedrooms						
106. All eligible categories						
107. 1 and 2 bedrooms						
108. 3 bedrooms						
109. 4 or more bedrooms						
110. E3 through E1						
111. 1 and 2 bedrooms						
112. 3 bedrooms						
113. 4 or more bedrooms						
114. Remarks O10 - O6 O5 - O4 O3 - W1 E9 - E7 E6 - E4 CIV-O CIV-E E3 - E1	5 bedroom requirements		1 bedroom requirements			
115. Authentication						
116. Name and location of installation						

FIG. 6-1. DD FORM 1377 - TABULATION OF FAMILY HOUSING SURVEY (Continued)

specified in the "K", "L", "M", "N", "O", or "P" documents. Projected private assets equal current private assets (from the DD 1377) plus any changes specified in the "Q" document. The calculated deficit is then multiplied by the programming factor¹ to obtain the programming deficit, which is what NAVFAC uses for planning purposes.

Preliminary versions of the DD 1377 and the DD 1378 (but not the Raw Data DD 1377) are reviewed by NAVFAC and the EFDs prior to issuing the final versions. The data in these forms are broken down by pay grade group and (where applicable)

¹Currently set by DoD at 90 percent, this factor accounts for the uncertainties associated with the projection process (and reduces the risk of overbuilding).

Derivation of long range housing requirements	Officers		Enlisted				Civilians	Total (A - G)		
	Operational	Students	Operational		Students					
			Eligible	Other	Eligible	Other				
	A	B	C	D	E	F	G	H		
1. Total personnel strength										
2. Permanent party housing strength										
3. Housing requirements factor										
4. Gross housing requirements										
Derivation of long range housing deficit	Officers	Eligible enlisted	Key civilians	Subtotal (A + B + C)		Other enlisted	Total			
	A	B	C	Number D	Percent E	F				
5. Gross eligible housing requirements										
6. Voluntarily separated families										
7. Effective housing requirements (5 minus 6)										
8. Programming limit - xx percent										
9. Suitable housing assets (total: 10 + 16)										
10. Military controlled assets (subtotal: 11 - 15)										
11. Military owned - existing										
12. Military owned - under contract										
13. Military owned - approved										
14. Military leased - existing and approved										
15. Other (specify)										
16. Not military controlled (subtotal: 17 - 21)										
17. Currently occupied - owned										
18. Currently occupied - rented										
19. Currently vacant - private for rent										
20. Currently vacant - FHA and VA for rent										
21. Under construction or firmly planned										
22. Net housing deficit (7 minus 9)										
23. Programming deficit										

Note: Lines 24 through 54 of DD 1378 are not generated by FACSO.

**FIG. 6-2. DD FORM 1378 - DETERMINATION OF HOUSING REQUIREMENTS
AND PROJECT COMPOSITION**

Qualitative analysis of requirements	Effective requirements			Suitable housing			Net deficit (C - F)
	Number	Percent	Program limit	Military control	Off post	Total (D + E)	
	A	B	C	D	E	F	
55. 010 through 06							
56. 1 and 2 bedrooms							
57. 3 bedrooms							
58. 4 or more bedrooms							
59. 05 through 04							
60. 1 and 2 bedrooms							
61. 3 bedrooms							
62. 4 or more bedrooms							
63. 03 through 01 and W4 through W1							
64. 1 and 2 bedrooms							
65. 3 bedrooms							
66. 4 or more bedrooms							
67. All officer grades							
68. 1 and 2 bedrooms							
69. 3 bedrooms							
70. 4 or more bedrooms							
71. E9 through E7							
72. 1 and 2 bedrooms							
73. 3 bedrooms							
74. 4 or more bedrooms							
75. E6 through E4							
76. 1 and 2 bedrooms							
77. 3 bedrooms							
78. 4 or more bedrooms							
79. All eligible enlisted							
80. 1 and 2 bedrooms							
81. 3 bedrooms							
82. 4 or more bedrooms							
83. All eligible military							
84. 1 and 2 bedrooms							
85. 3 bedrooms							
86. 4 or more bedrooms							

**FIG. 6-2. DD FORM 1378 – DETERMINATION OF HOUSING REQUIREMENTS
AND PROJECT COMPOSITION (Continued)**

Qualitative analysis of requirements	Effective requirements			Suitable housing			Net deficit (C - F)
	Number	Percent	Program limit	Military control	Off post	Total (D + E)	
	A	B	C	D	E	F	
87. Key civilians -- O equivalent							
88. 1 and 2 bedrooms							
89. 3 bedrooms							
90. 4 or more bedrooms							
91. Key civilians - E equivalent							
92. 1 and 2 bedrooms							
93. 3 bedrooms							
94. 4 or more bedrooms							
95. All eligible categories							
96. 1 and 2 bedrooms							
97. 3 bedrooms							
98. 4 or more bedrooms							
99. E3 through E1							
100. 1 and 2 bedrooms							
101. 3 bedrooms							
102. 4 or more bedrooms							
The following bedroom units by grade are included/excluded	SOQ	FGO	CGO	Enlisted	Civilian	Other	
103. Remarks							
Line 11 excludes							
1 or 2 bedrooms							
3 bedrooms							
4 or more bedrooms							
Line 11 includes							
1 or 2 bedrooms							
3 bedrooms							
4 or more bedrooms							

Note: SOQ=senior officer quarters; FGO=field grade officers; CGO=company grade officers.

**FIG. 6-2. DD FORM 1378 -- DETERMINATION OF HOUSING REQUIREMENTS
AND PROJECT COMPOSITION (Continued)**

The following bedroom units by grade are included/excluded	SOQ	FGO	CGO	Enlisted	Civilian	Other
Line 12 includes 1 or 2 bedrooms 3 bedrooms 4 or more bedrooms						
Line 13 includes 1 or 2 bedrooms 3 bedrooms 4 or more bedrooms						
Line 14 includes 1 or 2 bedrooms 3 bedrooms 4 or more bedrooms						
Line 15 includes 1 or 2 bedrooms 3 bedrooms 4 or more bedrooms						
Line 21 includes 1 or 2 bedrooms 3 bedrooms 4 or more bedrooms						
104. Authentication						
105. Name and location of installation						

FIG. 6-2. DD FORM 1378 – DETERMINATION OF HOUSING REQUIREMENTS AND PROJECT COMPOSITION (Continued)

by bedroom category within each pay grade group. FACSO also produces geographical and Service summaries for the final DD 1377 and the DD 1378.

The EFDs then generate a DD 1523 (Figure 6-3), which serves as the justification for programming recommendations at each complex. That form initially combines current requirements and asset data from the DD 1377 with projected requirements and asset data from the DD 1378. However, the deficits reported on the DD 1523 may differ from those reported on the DD 1377 and DD 1378 because data from alternative sources may be substituted for selected items. In particular, housing market analysis results are often used to revise the estimates of vacant private rental housing. In addition, proposed projects included (and reflected in the calculated

MILITARY FAMILY HOUSING JUSTIFICATION				1. DATE OF REPORT (YYYYMMDD)		2. FISCAL YEAR		REPORT CONTROL SYMBOL	
3. DOD COMPONENT		4. REPORTING INSTALLATION							
5. DATA AS OF		a. NAME				b. LOCATION			
ANALYSIS OF REQUIREMENTS AND ASSETS		CURRENT				PROJECTED			
		OFFICER (a)	E9 - E4 (b)	E3 - E1 (c)	TOTAL (d)	OFFICER (e)	E9 - E4 (f)	E3 - E1 (g)	TOTAL (h)
6. TOTAL PERSONNEL STRENGTH									
7. PERMANENT PARTY PERSONNEL									
8. GROSS FAMILY HOUSING REQUIREMENTS									
9. TOTAL UNACCEPTABLY HOUSED (a + b + c)									
a. INVOLUNTARILY SEPARATED									
b. IN MILITARY HOUSING TO BE DISPOSED / REPLACED									
c. UNACCEPTABLY HOUSED - IN COMMUNITY									
10. VOLUNTARY SEPARATIONS									
11. EFFECTIVE HOUSING REQUIREMENTS									
12. HOUSING ASSETS (a + b)									
a. UNDER MILITARY CONTROL									
(1) Housed in Existing DOD Owned / Controlled									
(2) Under Contract / Approved									
(3) Vacant									
(4) Inactive									
b. PRIVATE HOUSING									
(1) Acceptably Housed									
(2) Acceptable Vacant Rental									
13. EFFECTIVE HOUSING DEFICIT									
14. PROPOSED PROJECT									
15. REMARKS (Specify item number)									

DD Form 1523, NOV 90

Previous editions are obsolete.

151 324

FIG. 6-3. DD FORM 1523 - MILITARY FAMILY HOUSING JUSTIFICATION

deficit) on the DD 1523 are not included (or reflected in the calculated deficit) on the DD 1378.

This brief description does not reflect the complexity of the underlying calculations. Appendix B contains four exhibits showing the formulas used to derive each cell on each form (for ease of interpretation, some of these formulas represent summaries or simplifications).

Figure 6-4 presents a flow chart showing how these forms relate to each other and to the various inputs. More detailed documentation can be found in NAVFAC Instruction 11101.91, NAVFAC Notice 11101 (annual), Family Housing Management Institute (FHMI) materials, and management specifications maintained by NAVFAC and FACSO.

FINDINGS

Theory

We believe that the calculations underlying the DD 1377 are generally valid; the DD 1376 results should be representative of the overall family-housing-eligible population at each complex. We believe that the calculations underlying the DD 1378 are also generally valid; the best way to predict the characteristics of future personnel at a complex is to use the characteristics of the current personnel at the same complex.

However, we are concerned about the problem most simply expressed as "garbage in, garbage out." No matter how sound the calculations are, the quality of the results cannot exceed the quality of the inputs. The many potential sources of input error reduce our ability to determine the overall accuracy of the deficit calculations. Sampling error is associated with the DD 1376 results (the Battelle study cited in Chapter 3 found little evidence of nonsampling error); the current base loading may be inaccurate because of omitted units or incorrect counts for nonstandard personnel categories; additional uncertainties are associated with the projected base loading; and the other input documents (particularly those associated with private housing assets) may also include incorrect information.

A related concern is NAVFAC's assumption that all currently occupied private units will be retained in the future. That assumption is fine for stable populations, but it is weak when rapid changes are expected (a situation that will be more common

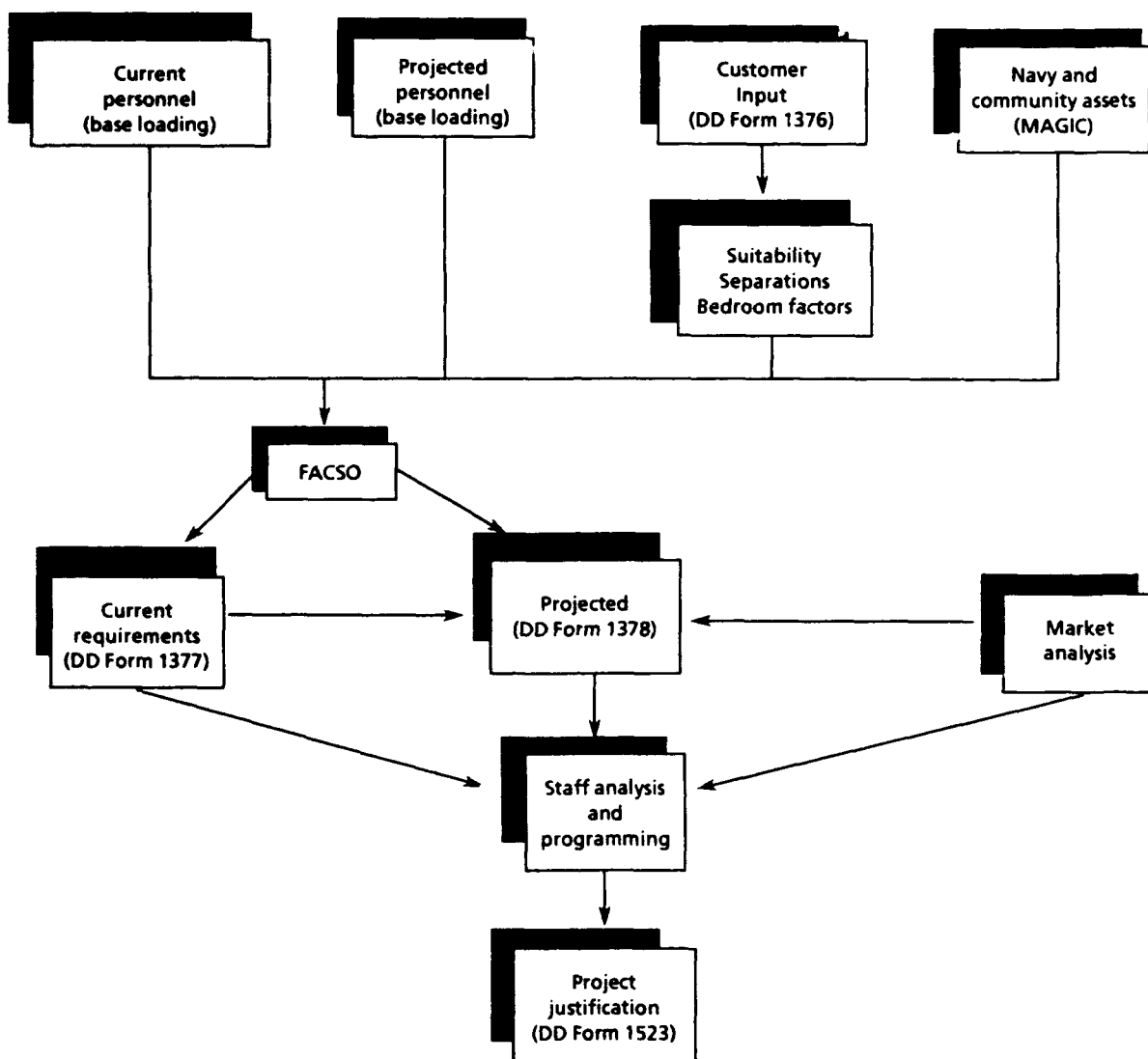


FIG. 6-4. SYSTEM FLOWCHART

in the future). For example, a complex with 600 current families will be assigned the same number of projected private assets (except for vacancies and new construction) whether its projected strength is 300, 600, or 900 families. Conversely, a complex that is expected to grow from 400 to 800 families will generally be assigned fewer projected private assets than a complex that is expected to shrink from 800 to 400 families.

Another concern is the treatment of E1-E3 personnel on the DD 1377 and DD 1378. Although many E1-E3 personnel are eligible for family housing, they are

categorized as "ineligible" or "other" enlisted on these forms and are not included in the "eligible" enlisted or military subtotals, even though the Deputy Assistant Secretary of Defense (Installations) stated in 1984 that the ineligible categorization "is both obsolete and offensive." While this appears to be primarily a forms design issue, it may also have implications for programming.

Practice

We have a number of (mostly minor) concerns regarding how the system actually operates. First, as noted in Chapter 3, some of the prior year DD 1376 data are quite old, and thus may no longer be representative. We also found that the history file contained 2 different years of data for a few complexes and that the earlier (wrong) data were being used for these complexes. Further confusing things is the fact that the "date of survey" on the DD 1377 is the date of the most recent survey cycle rather than the date the last survey was actually conducted at that complex.

Second, edit corrections are apparently being applied twice -- once right after the data are keypunched and again when they are transferred onto the current (and history) file. Because the random assignment of certain values such as separation status may not have the same results both times, the raw data DD 1377 results in an update phase may differ very slightly from the raw data DD 1377 results in a questionnaire phase for the same complex.

Third, certain results may be incorrect and/or illogical. We found several such situations:

- When no private housing exists (some calculations use ratios that have values of zero for the denominator)
- When civilians live in military housing (the "F" and "G" documents have no entries for civilians although the "K" document does)
- When the current designation and occupancy of military housing differ widely (if designated units exceed actual strength, negative private assets may be generated)
- When civilians are included in the DD 1376 data but not in base loading (civilian off-post assets will be carried forward without offsetting requirements)

- When the data on off-post assets by type (rental, owned, etc.) disagree with the data on off-post assets by pay grade and bedrooms on the same form (because different methodologies are used).

Fourth, the unsuitability tabulations on the DD 1377 are not as useful as they could be. Excess bedrooms are grouped with substandard housing; the true incidence of cost unsuitability is hard to discern because the "substandard" and "excess distance" counts include some instances of excess cost; and since the excess cost breakdowns are badly outdated (i.e., the dollar amounts are too low), over 80 percent of the excess cost counts on the latest worldwide DD 1377 fall into the highest category.

Fifth, the presentation of key civilian data is inconsistent. The first part of both the DD 1377 and the DD 1378 has one column for all (key) civilians, but the latter part of both forms has separate lines for officer- and enlisted-equivalents. Meanwhile, the DD 1523 does not have a place to show civilians separately; they are supposed to be included in the military grade equivalent columns. This mapping is complicated by the fact that the pay grade groupings added by FACSO to the DD 1376 data do not (but could) separately identify officer- and enlisted-equivalent key civilians.

Finally, and perhaps most important, we repeatedly found evidence that NAVFAC is not adequately checking the DD 1377 or DD 1378 results. Some preference and unsuitability data elements in the DD 1377 were being improperly zeroed out by the programs (these problems did not affect the deficit and have since been fixed by FACSO). Even after accounting for civilians and other Service personnel, the base loading and DD 1377/1378 worldwide strength totals do not appear to match official Navy figures (see Chapter 2). Raw data DD 1377 results for the same complex changed dramatically from year to year (see Appendix B). A discrepancy seems to exist between the Navy's latest worldwide DD 1377, which shows 70,842 total units and 3,452 substandard units, and the 9/30/90 Navy Family Housing Worldwide Utilization and Inventory, which showed 73,338 total units (1,510 inactive) and 3,835 substandard units.

We believe that these findings reflect the assertion we made earlier in this report that FACSO does not sufficiently understand why certain things are done, while NAVFAC does not sufficiently understand how certain things are done. The scheduling problems noted in Chapter 2 may also play a role; very little time is

available to review and analyze the results before submitting the required programming documents. Finally, too much attention seems to have been paid to the bottom line results, with too little attention to (or understanding of) the underlying data at all organizational levels.

Sensitivity Analyses

It is useful to know how sensitive the results of the requirements determination process (i.e., the calculated deficits or surpluses) are to change in key inputs. Although for each type of input the sensitivities can vary widely by complex, pay grade, and year, it is possible to draw some general conclusions. Overall, the results are highly sensitive to the questionnaire data, less sensitive to housing asset data, and even less sensitive to base loading data.

Changes to current or projected base loading usually cause smaller changes in the deficit/surplus since many personnel are not eligible for family housing. The July 1991 worldwide DD 1377 shows that 54 percent of all total personnel were permanent party; 58 percent of all permanent party were families; and 91 percent of all families required family housing (i.e., were not voluntarily separated). On average, therefore, an increase of 100 total personnel would have increased the deficit – or reduced the surplus – by 29 ($100 \times 0.54 \times 0.58 \times 0.91$); an increase of 100 permanent party would have increased the deficit by 53 ($100 \times 0.58 \times 0.91$); and an increase of 100 families would have increased the deficit by 91 (100×0.91). However, the actual sensitivities will be much higher at complexes with relatively few temporary or bachelor personnel. For example, an increase of 100 total personnel in FY91 (with the average pay grade distribution for each complex) would have increased the current deficit by only 9 at Dahlgren but by 76 at Lisbon.

Changes to military or private housing assets usually cause equivalent changes to the deficit/surplus since all suitable assets are used to offset requirements. Therefore, the addition of 100 units to any of the appropriate input documents would reduce the deficit by 100. The only caveat is that some housing-related input documents apply to projected calculations only, while others apply to current calculations only; thus, certain changes will affect either the DD 1377 or the DD 1378 (but not both).

Finally, changes in questionnaire (DD 1376) results usually cause much larger changes in the deficit/surplus because most respondents represent several families in

the current base loading population. At the FY91 survey complexes, inferences about 135,021 total families were based on 24,226 total responses. Therefore, on average, reclassifying 100 respondents as unsuitably housed would have increased the current deficit by 557 ($100 \times 135,021 / 24,226$). However, the actual sensitivities will be much higher at complexes with high sampling factors (and/or low response rates). For example, reclassifying 100 FY91 respondents (with the average pay grade distribution for each complex) as unsuitably housed would have increased the current deficit by only 115 at Keflavik but by 3,966 at San Diego.

ALTERNATIVE AND ADJUNCT METHODOLOGIES

DoD Consolidated VHA Form

The Services currently use several different forms to document VHA eligibility and amounts. Largely as a result of previous work done by the Logistics Management Institute (LMI), the Assistant Secretary of Defense for Production and Logistics [ASD(P&L)] is planning to introduce a single consolidated VHA form. That form would also include versions of most questions currently on the DD 1376.

Once this new form is in place [current ASD(P&L) plans call for full implementation in 1993], NAVFAC will no longer need to administer the family housing questionnaire to military personnel collecting BAQ at CONUS locations. In addition, since the VHA form would be completed by all eligible personnel, these data would no longer be subject to sampling error and would no longer have to be 'blown up' to the total (current base loading) population.

However, among the many issues that must be resolved by DoD and/or NAVFAC before those benefits can be realized are the following:

- What the final version of the form will actually look like
- How the new suitability questions will affect the Navy's requirements
- Whether the Navy will continue to inspect unsuitable units
- How the Navy will access data collected on this form
- How the Navy will obtain comparable data for OCONUS locations
- Whether the Navy will need additional data on personnel living on-base

- Whether DoD can be certain of attaining 100 percent response (and, if not, what the Navy must do to compensate for nonresponse)
- What editing will be performed by hand (at point of intake) and by computer (after scanning)
- Whether alternative procedures will be used (instead of completing the entire form) for changing/updating selected data elements.

Air Force

Among the other Services, the Air Force's methodology most closely resembles the Navy's. It administers the DD 1376; it has FACSO process and tabulate the results; it generates MAGIC input documents for housing and personnel assets; it uses 3-year average marriage factors to project BAQ eligibility; it conducts market analyses for key locations; and it has FACSO produce the DD 1377 and DD 1378.

However, several nontrivial differences exist between the Air Force and the Navy approaches. DD 1376 samples for all Air Force complexes are drawn locally, while most Navy samples are drawn by FACSO. Air Force "B" documents – current personnel strength – are prepared locally (the Navy generates those documents from base loading) and reflect actual strengths as of the 31 January survey date (the Navy uses average counts for certain categories and the effective date varies). The Air Force has apparently begun to have its market analysis contractors prepare the DD 1523 (in the Navy, that form is prepared by the EFDs).

Marine Corps

The Marine Corps no longer administers the DD 1376. Its stated reasons include inconsistent results over time, shortage of (and turnover in) available staff, low response rates, and questions regarding the future validity of current results. Administrative problems and difficulties obtaining the necessary base loading data may have also been factors.

Instead, the Marine Corps currently relies almost entirely on market analyses. It generates personnel strengths centrally (the field validates which units are currently where); it uses installation-level data to project pay grade and bedroom distributions; and it uses the same pay-grade-specific marriage factors for all installations. Until the consolidated VHA form is implemented, the Marine Corps

will have no data on separations and can only address suitability through the market analyses.

Army

Until recently, the Army used a method similar to that of the Navy for determining family housing requirements (at one time, FACSO processed DD 1376 data for all four Services). However, prompted by internal concerns and by a Government Accounting Office investigation, the Army – in conjunction with consultants at the University of Maryland – has developed a new personal computer system that it plans to use for the first time this year at most of its CONUS installations.²

The most significant change is in the treatment of private rental housing. The Navy currently collects data on vacant and new units and then adds its estimated shares of such units to the number of occupied units (DD 1376 results projected to the overall population). The Army will use an econometric model to estimate market-clearing rents (the rent at which supply equals demand) and the associated number of rental housing units in the relevant market area for each of six bedroom categories, and will then calculate its estimated share of these units. The model is driven by installation data plus demographic and economic statistics for the nearest metropolitan area.

The new Army methodology has several other differences. First, the family and bachelor (unaccompanied personnel) housing analyses are fully integrated. Second, more detailed grade and bedroom categories are used. Third, the requirements data are collected and processed at the installation (rather than unit) level. Fourth, an assignment model automatically performs cross-leveling and redesignation (applying surpluses in one grade/bedroom category against deficits in another category) to minimize the final deficit. Fifth, the DD 1376 is no longer used (the Army is awaiting implementation of the consolidated VHA form).

This methodology has some obvious strengths. It has the potential to be considerably cheaper, more flexible, and more responsive than the Navy's current system. We believe that the integration of family and bachelor housing analyses, the cross-leveling and reassignment model, and the use of more detailed grade and

²For a detailed description, see Guisseppi A. Forgionne, "HANS: A Decision Support System for Military Housing Managers", *Interfaces* 21:6, November-December 1991, pp. 37-51.

bedroom categories are improvements over the Navy's (and Army's) current approach.

However, this new Army methodology is unproven. Until such planned enhancements as the estimation of cost- and bedroom-specific equilibrium market shares and the recalibration of the regression equations using 1990 Census data occur, we have serious concerns about the accuracy of the private housing estimates. The limited separation and suitability data combined with the greater level of aggregation also make us question the accuracy of the requirements projections. Furthermore, the implementation and operation of this system may require a higher level of analytical and computer skills than is typically found among installation housing staff.

LMI Personal Computer Model

To help understand the workings and test the sensitivities of the Navy's process, we developed a personal computer (PC) model (programmed in LOTUS 1-2-3, Version 3.1) that replicates all of the key calculations.³ To make this model more user-friendly, we have added a number of menus and macro-driven commands that link all of the component files and greatly simplify its operation.

The PC model can calculate a raw data DD 1377, a DD 1377, a DD 1378, and/or a preliminary DD 1523 for any complex, using actual or simulated inputs. DD 1376 data and supplemental data can be read in as text or as a spreadsheet after being downloaded from FACSO, while the input documents and other MAGIC data must be entered into one of two spreadsheets (personnel or housing), again after being downloaded from FACSO.

This PC model is not intended to replace the FACSO system. It cannot generate geographical or service totals; it relies on FACSO to initially process and provide the DD 1376 and MAGIC data; and the workload (and disk storage requirements) associated with analyzing all 120 + Navy complexes would be prohibitive.

Instead, the PC model should be a valuable companion piece to the FACSO system. It will let the user quickly see the effects of current and/or projected changes to personnel and/or housing inputs for any given complex; it will increase the user's

³The model results may not exactly match FACSO outputs because of rounding conventions and other minor computational differences.

understanding of how the FACSO calculations actually work and how the various data elements are interrelated; and it will mean that FACSO will only have to (re)run its base loading and requirements in response to "official" changes. We expect that the model will have been installed at NAVFAC headquarters (accompanied by a user's manual) by the time this report is published. Any subsequent distribution of the model (e.g., to EFDs) will be controlled by NAVFAC.

CHAPTER 7

RECOMMENDATIONS

One of NAVFAC's most difficult tasks is making accurate, detailed, long-term projections of family housing supply and demand for market areas that do not correspond to standard metropolitan definitions. While all of the inherent problems cannot be solved, the projections can and should be improved. We believe that the current system needs a lot of work but is worth fixing.

The system's basic theory appears to be sound (although minor changes are advisable), but its administration and operation are weak. The problems we identified have multiple causes: conflicting views about how accurate and timely the results can/should be; too many manual operations (insufficient use of automation); a poor understanding by NAVFAC, FACSO, EFD, and activity staff of how the system works and what it is intended to do; and inadequate sharing of input and output data. Our specific recommendations are presented in the following sections.

BASE LOADING

Unit Identification

Since UICs and CCs are the two main building blocks for the entire base loading system, the housing activity (HAL) listing must be complete and accurate. We therefore recommend that NAVFAC take the following actions with respect to unit identification:

- Continue having all EFDs and activities review the HAL on an annual basis
- Develop a short form and procedure to allow simplified periodic (e.g., quarterly) reporting of any unit changes
- Assign a complex code (CC) to all UICs currently represented in the BUPERS or MAPMIS files but not included in the HAL
- Identify all UICs associated with specific ships so that the CCs for affected shore units can also be changed when ships are reassigned.

Personnel Data

The total personnel strengths generated by base loading differ from official Navy figures. Those differences reflect other Service personnel at Navy complexes, the definition and treatment of special groups (students, transients, rotational personnel, etc.), and changes resulting from field review. The length of the field review process also prevents NAVFAC from using the latest official Navy data.

We believe that current base loading should be a snapshot of actual strengths as of a given date, while projected base loading should be as up-to-date and accurate as possible. We therefore recommend that NAVFAC take the following actions with respect to personnel data:

- Generate projected personnel reports separately from – and later than – current personnel reports since the projections are not used as early in the process and are more likely to be significantly revised by the Navy
- Eliminate all field review of preliminary CPS and PPS data for regular Navy personnel to shorten the cycle and retain consistency with published Navy totals
- Establish links with other Services to obtain automated data on other Service personnel at Navy complexes
- Develop definitions based on UIC, grade, complex, and/or other criteria for automated identification of key civilians
- Use more detailed pay grade groupings, complex-specific data, and a consistent methodology (e.g., 1-year versus 3-year averages) in calculating marriage factors to improve the accuracy of projected BAQ requirements
- Use actual counts rather than average on-board data for students and other special groups; these counts should be analyzed for variability to determine appropriate as-of dates for data collection, and should be compared to on-board data to see if adjustments are needed at selected locations
- Discourage revisions to the “B” or “J” documents (rerun base loading if significant official changes occur) to ensure consistency between bachelor and family housing reports and to avoid making the same changes twice.

INPUT DOCUMENTS AND MAGIC

Manual and electronic input documents are used to record much of the housing and personnel data used by NAVFAC. The MAGIC system is the vehicle for storing, accessing, and updating those documents and other requirements-related data

(marriage and bedroom factors, MAHC tables, etc.). We therefore recommend that NAVFAC take the following actions with respect to the input documents and MAGIC:

- Eliminate input document records with all zero entries to avoid distorting DD Form 1377/1378 calculations, to reduce data storage requirements, and to improve system performance
- Identify and correct internal inconsistencies in input document records (incorrect addition, missing data, etc.)
- Produce and analyze tabulations of records by type and complex to make sure that all required input documents are present and that only those documents are present
- Try to link all data elements appearing in more than one file so they can be updated simultaneously
- Before generating DD Forms 1377 and 1378, examine the dates in MAGIC to identify any input documents that have not been updated since the previous cycle and notify the appropriate EFDs of those documents
- Create a new automated input document to accommodate adjustments to separation rates because of large ship populations or for other reasons (instead of hard-coding these adjustments in the FACSO programs)
- Explore the use of referral data (in lieu of separate data collections) as the source for the "D" document
- Eliminate the "E" document (by merging it into the "D" document) to reduce resource requirements, but expand the "D" and "Q" documents to show market area totals and market shares
- Eliminate the "F" document, using actual occupancy/vacancy data ("G" document) for all current analysis after adding bedroom breakdowns to the "G" document and the underlying DD 1411 report
- Combine approved and under-contract MILCON units on the "L" document, and redefine the "M" document to cover units being rehabilitated/renovated (using the same format)
- For the longer term, design and implement two consolidated input documents to replace the current 14 – one for housing data and the other for personnel data.

FAMILY HOUSING QUESTIONNAIRE

Since the consolidated VHA form due to be implemented by DoD will make the family housing questionnaire (DD 1376) obsolete, we have scaled back or omitted some recommendations. In any event, NAVFAC will definitely have to conduct a survey in FY92 and may still need to conduct a survey in FY93 (it is impossible to predict the fate of the survey beyond that time).

Site Selection

Unless it needs new information, NAVFAC does not wish to impose on local housing office staff the additional work associated with conducting a survey. We therefore recommend that NAVFAC take the following actions with respect to site selection:

- Review the data available at FACSO to verify the last survey date for each complex
- Select all complexes that have not conducted a survey within the past 5 years
- Select all complexes with ongoing or planned family housing construction (or acquisition) projects
- Select any other complexes at which major changes in requirements or assets are expected (and were not reflected in the last survey)
- Ensure that complexes with no projected deficit, stable requirements, and stable housing assets are only surveyed every 5 years.

Sampling

As noted in Chapter 3, the SAMS methodology is designed for a sampling error of at most 6 percent (with 90 percent confidence). The desired level of precision is a policy decision, and since the FY91 results showed an even smaller sampling error, we do not see any need to change the basic sampling factors. However, we recommend that NAVFAC take the following actions with respect to sampling:

- Ensure that all selected complexes undergo a SAMS to improve consistency and response tracking (the SAMS methodology will generate a 100 percent sample for small complexes)

- Raise the oversampling factor for E1 through E3 personnel from 150 percent to 200 percent (since NAVFAC has historically been unable to achieve 65 percent response rates for that group)
- Determine the sampling factors using base loading counts (rather than BUPERS counts) since the results are also applied to key civilians and other Service personnel
- Include data files for key civilians and other Service personnel in the selection process (NAVFAC plans to include Marine Corps personnel in the FY92 sampling) to improve sample size and response tracking, ensure representativeness, and reduce local housing office workload.

If the first three recommendations had been implemented in FY91, 29,450 military personnel would have been selected at the 40 surveyed complexes instead of 30,653. Assuming response rates of 50 percent for E1 through E3 and 65 percent for all other pay grades, NAVFAC would have received 18,431 military responses instead of 23,827, and the absolute sampling error would have been 2.6 percent instead of 2.4 percent. With the current methodology, if all targets had been met exactly, 20,906 military responses would have been received in FY91 and the absolute sampling error would have been 2.6 percent.

Questionnaire Design

It is too late to change the DD Form 1376 for the FY92 survey. Some of our proposed changes will not be cost-effective unless the survey is continued beyond FY93, and others will apparently be incorporated into the new VHA form. Nevertheless, we recommend that NAVFAC take the following actions (subject to the caveats stated above) with respect to questionnaire design:

- Add a service field to identify personnel from other Services housed at Navy complexes
- Restructure the question on dependents (#7) to explicitly identify spouses, rather than having to infer their existence based on age
- Restructure the question on separation status (#8) to clarify the distinction between voluntary and involuntary separation and to capture separation reasons
- Combine the questions on preference (#9 and #12) and reword the new question to learn the reasons for the most recent actual decision regarding private versus military housing

- Instruct personnel living in military housing to bypass all remaining questions (after question #12) to minimize response burden and processing time and to eliminate spurious data
- Change the commuting time question (#14) from a yes/no format to the number of minutes (actual or categorical) to allow an assessment of the impacts of local or global changes in market area definitions
- Clarify the wording of the question on ownership reason (#17) to eliminate people who bought for tax or other nonapplicable reasons
- Eliminate the unused (by FACSO/NAVFAC) and infrequently answered mobile home question (#18)
- With FACSO, investigate the feasibility and cost-effectiveness of making the form machine-readable.

In an earlier study, LMI recommended that a number of data elements currently collected by the Services be omitted from a consolidated VHA form.¹ However, additional analyses have led us to conclude that a few of those data elements proposed for omission (involuntary separation, marital status, dependent relationship, on-/off-post preferences) are in fact useful for determining family housing requirements, and some of them have subsequently been incorporated into the consolidated VHA form at the Services' request.

Local Processing

We found wide variations in how – and how well – the survey responses were processed by activity staff. To improve the quantity and quality of the questionnaire data, we recommend that NAVFAC take the following actions with respect to local processing:

- Distribute detailed instructions for on-site editing of DD Form 1376 to all EFDs and activities to ensure that all questionnaires are completely and correctly filled out
- Place increased emphasis on obtaining (or postcoding) Social Security numbers for subsequent use in matching against selectee lists and other data files

¹Douglas M. Brown and James L. Hathaway, *Consolidating DoD Housing and Allowance Data Collection*, LMI Report PL013R1, January 1991.

- Issue more detailed on-site inspection rules from headquarters, and have the EFD staff monitor on-site inspection results and investigate any sites with extremely high (or low) reversal rates
- Distribute guidance for working with local commanders to maximize response rates and minimize response time
- Consider follow-up mailings (in lieu of additional sampling) at complexes with low initial response rates
- Send questionnaire batches from OCONUS locations to FACSO by express mail or equivalent means to speed up processing and reduce losses
- Instruct complex coordinators to make copies of all responses and keep them until the originals are returned from FACSO in case batches are lost or questions arise during FACSO processing.

FACSO Processing

Although considerable resources are devoted to processing the DD 1376 data at FACSO, and although the current questionnaire rejection rates are quite low, we believe that this processing can be improved with minimal additional effort. We therefore recommend that FACSO (with NAVFAC's assistance) take the following actions:

- Include logic checks in keypunch programs for invalid or missing values
- Remove the limit on the total number of errors counted per questionnaire
- Add missing or invalid Social Security numbers as a rejection condition
- Cease correcting preference answers
- Contact complex coordinators (and notify appropriate EFDs) to resolve instances in which batches are lost or rejection rates are unusually high
- Modify the edit report to add the number of corrections for spouses reported as dependents (NAVFAC and FACSO are apparently already working on this change)
- Modify the edit report to include the number of personnel selected, to add a column for blank or invalid pay grade, and to provide for four-digit rejection/correction counts
- Separately identify officer- and enlisted-equivalent key civilians in the supplemental coding of pay grade groups

- Delete civilian responses from complexes without any key civilians on their "B" document.

Other

If survey nonrespondents have different housing-related characteristics than survey respondents, the DD 1376 tabulations may not accurately reflect the total family-housing-eligible population. To see whether adjustments for response bias might be needed, and to see what the impact of switching to a consolidated VHA form might be, we recommend that NAVFAC conduct special studies at one or more relatively large complexes. These studies would entail distributing a questionnaire containing key DD 1376 data elements to FY92 sample selectees who did not respond to the initial survey, and then testing for statistically significant differences between the results of these special studies and the results of the initial survey.

MARKET ANALYSIS

NAVFAC and the EFDs clearly need to continue acquiring market analyses that help assess the future availability of private-sector housing assets. However, we are concerned that the FHMAs, as they are currently designed and executed, are not adequately satisfying this requirement. In particular, we believe that better estimates of the Navy's market share(s) are essential and that the studies themselves should be more focused and more consistent, with a clearer overall objective.

Market Share

Although the market share concept is fairly simple, its quantification is extremely difficult. Within a given market area, the proportion of current private housing units occupied by Navy families can vary by size, cost, and tenure. This proportion can also change over time, depending upon local economic and demographic factors. Finally, the proportion of existing vacant or new units that Navy families can expect to 'capture' may differ significantly in either direction from the current occupied share.

Notwithstanding these difficulties, we believe that a more rigorous and consistent market share methodology is both feasible and advisable. We therefore recommend that NAVFAC initiate a concerted effort to calculate baseline (1990) market shares for every CONUS complex with significant numbers of personnel

living in private housing (MAGIC and DD 1376 data imply that the Navy has about 50 such complexes).

We further recommend that this initiative be accomplished through a single national study since substantial economies of scale in data collection and processing could be realized and since consistency and coordination could be maximized. However, we recognize that multiple local studies might be easier to acquire since each individual study could probably be kept under the \$25,000 limit for small purchases.

We recommend that NAVFAC take the following actions in performing these baseline calculations:

- Define the local market areas in terms of census blocks and/or tracts
- Use 1990 Census data to measure the number of occupied private units in the market area by size, cost, and tenure
- Use DD 1377 results and/or referral office data to measure the number of Navy-occupied private units in the market area by size and tenure
- Use DD 1376 data and/or referral office data to estimate the distribution of these Navy-occupied private units by cost.

If the study results indicate that variations by tenure/cost/size are fairly minor, a more cost-effective approach might be for NAVFAC to ignore these variations and use a single share for each complex. Similarly, if differences between complexes are fairly minor, a more cost-effective approach for NAVFAC might be to use the same share(s) for all (or at least most) complexes and to incorporate the share(s) into the "D" and "Q" documents.

Market Analyses

We recommend that once baseline shares have been calculated, NAVFAC conduct modified FHMA's for complexes where it is planning to acquire housing. In particular, we recommend that in these FHMA's, the following tasks be performed for the local market area:

- Project the total number of existing suitable private housing units expected to be vacant in 5 years by cost, size, and tenure

- Project the effective available number of vacant private housing units in 5 years, accounting for seasonality and recognizing that a certain number of units will always be vacant
- Project the total number of new private housing units by cost (selling price or rent), size, and tenure expected in 5 years
- Project future market share(s) by incorporating expected changes to both the numerator and the denominator of the baseline share(s)
- Produce "D" and "Q" documents by applying the projected market share(s) to the projected effective numbers of vacant and new units.

CALCULATIONS AND OUTPUTS

Based on the findings presented in Chapter 6, we believe that the process by which requirements are determined and the way the results of that process are presented can be improved. We also address suitability criteria and their application in this section, even though they were discussed separately in Chapter 3 because of their impact on the deficit calculations.

Suitability

Although DoD dictates overall housing suitability criteria, NAVFAC has some leeway in how those criteria are applied. The current criteria are being reviewed by DoD, and NAVFAC can try to influence the results of that review. We therefore recommend that NAVFAC take the following actions with respect to suitability:

- Ask DoD to clarify whether (or under what circumstances) suitability should be determined by the Services or be reported by personnel involved
- Encourage DoD to make a larger portion of housing allowances variable (to reflect the actual differences between high-cost and low-cost areas) and to establish a minimum fixed level for lower pay grades (to reduce the proportion of income those personnel are currently spending on housing)
- Request that DoD restrict the application of certain criteria (e.g., availability of laundry and parking) to military assets or at least code those assets separately so the deficit is not artificially inflated by otherwise-suitable existing private units
- Request that DoD eliminate "reason for purchase" in determining the suitability of owned units and ask DoD to either declare all homeowners suitable with respect to cost or develop MAHC guidelines for owned units on

the basis of the monthly cost implied by the current market value (rather than the current owner's actual mortgage payments)

- Request that OSD develop guidance for modifying the distance criterion at complexes at which large numbers of families voluntarily live further than 60 minutes away
- Add private units currently occupied by voluntarily or involuntarily separated personnel to the pool of potentially suitable housing
- Attempt to account for private housing units that are unsuitable for their current occupants because of cost or size but have the potential to be suitable for future occupants
- Encourage DoD to develop language that will explain the equipment, utilities, condition, and neighborhood criteria without biasing responses in either direction
- Discontinue the current confirm-reverse process once the new VHA form is implemented but continue making periodic inspections to keep abreast of market conditions and to investigate abnormal unsuitability rates.

FORMS DD 1377 and DD 1378

Much of the information on Forms DD 1377 and DD 1378 is either not useful or not properly used. The FACSO programs can also produce illogical or incorrect results. We therefore recommend that NAVFAC take the following actions with respect to these DD forms:

- Using DD 1376 and selectee list data, perform ship/shore comparisons at selected locations (similar to the Long Beach analysis described in Appendix A) to identify and quantify any necessary adjustments to separation rates
- Perform follow-up studies of nonrespondents to see whether DD 1376 results need to be adjusted for nonresponse bias (either at specific complexes or overall)
- Modify FACSO programs to prevent zero-divide errors when no off-post assets exist
- Modify FACSO programs to prevent negative numbers of off-post assets when current military housing designations do not match requirements
- Modify FACSO programs so that off-post housing asset data on the first two pages of the DD 1377 and the first page of the DD 1378 match the totals of detailed data on subsequent pages

- Apply 90 percent (or other) programming limits the same way to all pay grade groups and bedroom categories
- Eliminate use of "ineligible" terminology and add grand total rows (i.e., including E1 through E3 personnel) for bedroom-specific data
- Change the unsuitability breakdown used on the DD 1377, replacing excess cost splits with one-/two-/three-way combinations of cost, bedrooms, and substandard conditions
- Display the date of the last actual survey for a complex, rather than the date of the most recent survey cycle.

TIMING

Because schedules for various requirements determination activities overlap and are interrelated, timing issues should be addressed jointly. We believe that the overall process (including base loading, family housing, and bachelor housing) should be shortened to 12 months and that base loading should occur later in the cycle to capture more timely official Navy personnel data. Our recommended new timetable is shown in Table 7-1. For simplicity, we have omitted several activities and we only show 1 month for some activities that may take longer. We also recognize that this timetable has implications for bachelor housing, which needs to be better integrated with the family housing and base loading processes.

INFORMATION SHARING

Last, and in some ways most important, NAVFAC needs to do a much better job of sharing information among headquarters, FACSO, EFD, and complex staff. The system collects, uses, and produces vast amounts of data, but too often those data are either not made available, not looked at, or not understood. In particular, the DD 1376 data – with responses from over 60,000 personnel on file at FACSO – are a valuable source of information.

At the request of several different Navy offices (and the Air Force), we have used DD 1376 data to help analyze the impacts of different suitability criteria options on housing requirements and the impacts of proposed housing projects on school and child care requirements. Providing these data in electronic form would also benefit the FHMA process. We therefore recommend that NAVFAC take the following actions with respect to information sharing:

TABLE 7-1

RECOMMENDED NEW FAMILY HOUSING REQUIREMENTS TIMETABLE

Month	Principal activities
July	NAVFAC/FACSO generate preliminary HAL
August	EFDs/complexes review preliminary HAL
September	NAVFAC updates HAL based on field review
October	NAVFAC obtains current personnel data files NAVFAC/FACSO generate preliminary CPS
November	EFDs/complexes review preliminary CPS EFDs/complexes indicate any changes to HAL
December	NAVFAC/FACSO generate final CPS NAVFAC/EFDs select complexes to survey NAVFAC obtains updated current personnel files
January	NAVFAC/FACSO generate survey samples NAVFAC/FACSO distribute selectee lists Complexes distribute questionnaires EFDs prepare/enter MAGIC input documents
February	Complexes receive and process questionnaires NAVFAC obtains projected personnel files NAVFAC/FACSO generate preliminary PPS EFDs/complexes review preliminary PPS
March	FACSO enters and edits questionnaires NAVFAC/FACSO generate final base loading
April	NAVFAC/FACSO generate preliminary DD 1377/1378s EFDs/complexes review preliminary DD 1377/1378s
May	NAVFAC/FACSO generate final DD 1377/1378s EFDs/complexes prepare preliminary DD 1523s
June	NAVFAC/FACSO updates all historical files NAVFAC/EFDs prepare and submit final DD 1523s

- Obtain annual downloads (for use on personal computers) of FACSO's files containing current and historical DD 1376 data
- Obtain and learn how to use standard commercial statistical software packages (SAS, SPSS, etc.) to analyze those data and track key variables²
- Make and distribute subsets of the personal computer files containing data for all of the complexes managed by each EFD
- Ensure that EFDs and complexes receive copies of DD 1376 edit reports so problems can be identified and corrected
- Distribute DD 1377s, DD 1378s, and DD 1523s to the complexes as well as the EFDs

²The Coast Guard uses commercial statistical software (SAS) to perform both regular and special analyses of its housing survey data.

- Direct FACSO to annually produce and distribute reports to each complex showing the numbers of personnel by pay grade group and accounting code to provide a better understanding of base loading data
- Produce and distribute an accurate, up-to-date, user-friendly version of the management specifications for the entire system (incorporating relevant portions of this report, modified as appropriate to minimize additional workload)
- Ensure that FHMI or comparable training is provided to all (sub)complex coordinators on a timely basis
- Minimize FHMI and other training during the survey implementation period to avoid leaving local housing offices with inadequate staffing
- Investigate with FACSO the feasibility of job sharing and/or job rotations to help both organizations better understand the system's logic and its operations
- Increase the overall level of contact and communications among headquarters, FACSO, EFD, and activity staff.

FUTURE TECHNOLOGY

One of NAVFAC's reasons for initiating this study was a concern that the technology underlying its requirements determination process was outdated. Our findings have partly – but not entirely – validated that concern. On the one hand, the reliance on mainframe computers and the transaction-based design of MAGIC makes it unnecessarily difficult to change base loading or other inputs, to analyze the impact on requirements of such changes, or to use DD 1376 data for other purposes. On the other hand, the present system works reasonably well (and can be made to work better) and the present hardware and software – although dated – are by no means obsolete.

To increase flexibility, responsiveness, and efficiency, we believe that the system should eventually be converted to personal computers (PCs). The LMI model shows that DD 1377/1378/1523 processing (and much of the MAGIC data) can be done on PCs. Questionnaire processing could also be done on PCs, particularly if the DD 1376 is replaced by a consolidated VHA form. However, because of the amounts of data involved, some base loading processing would probably have to remain on mainframes for the foreseeable future.

Force reductions, budget cuts, base closures and realignments, the success of the Army's econometric model, and other NAVFAC and Navy information technology plans could influence the fate of the consolidated VHA form and the use of any new system. Any such influences will become clearer over time. We therefore recommend that NAVFAC and FACSO jointly develop a preliminary design and implementation plan for a PC-based system over the next 12 – 18 months.

Virtually all of our other recommendations are compatible with a PC-based system, since the methodology itself would not have to change significantly. Some recommendations (such as automated links with other Services' personnel data files) would facilitate a PC conversion. Finally, NAVFAC can begin to realize the benefits of PC technology immediately by implementing our information-sharing recommendations and by utilizing the LMI model.

APPENDIX A

SHIP-SHORE COMPARISONS AT LONG BEACH

BACKGROUND

Personnel eligible for family housing and assigned to ships are often excluded from family housing questionnaire (DD 1376) samples because they tend to be deployed or otherwise not available during the survey period. Statistics on these ship-based personnel are therefore inferred using data collected from sample selectees responding to the survey (most of whom are shore-based).

Such inferences assume that ship and shore personnel have similar housing-related characteristics. If that assumption is invalid (i.e., if significant differences exist between ship and shore personnel after controlling for location and pay grade), the DD 1376 results may be biased, and that bias could distort the calculation of family housing deficits.

To test this assumption, the Naval Facilities Engineering Command (NAVFAC) conducted a special out-of-cycle survey at Naval Center Long Beach, Calif., in March and April 1991. The sample consisted of 1,448 personnel selected using the sample method survey (SAMS) methodology described in Chapter 3, and encompassed a number of ship units that were excluded from the regular survey sample drawn in January 1991.

RESPONSE

A total of 996 personnel responded to this special survey. We categorized those respondents as either ship-based or shore-based personnel depending on their unit identification code (UIC). Since that code was reported on the selectee data file but not on the response data file, we linked the two data files using Social Security numbers. Because of missing or invalid data, we were only able to classify (and thus analyze) 982 of the 996 respondents.

Table A-1 displays the number of selectees, the number of respondents, and the associated response rate for each major personnel category. The overall response rate

of 69 percent is above the 65 percent target set by NAVFAC but below the 77 percent response rate achieved for the regular Long Beach survey. The typical pattern of higher response rates among the higher grades was evident, and the ship and shore response rates were similar.

TABLE A-1
LONG BEACH SELECTION AND RESPONSE DATA

Personnel category	# Selected	# Responded	% Responded
Total	1,448	996	69
O6-O10	34	33	97
O4-O5	194	154	79
W1-O3	346	270	78
E7-E9	270	176	65
E4-E6	318	204	64
E1-E3	286	159	56
Shore	663	465^a	70
Ship	785	517^a	66

^a Shore and ship response counts exclude 14 questionnaires with missing or invalid Social Security Numbers.

ANALYSIS AND RESULTS

We tabulated ship and shore responses separately, and then tested for any statistically significant variations between these subsets. We made separate comparisons within each pay grade group to ensure that the overall results did not merely reflect differences in the grade distribution (a much higher proportion of the ship personnel were enlisted).

Table A-2 summarizes our results. We found that ship personnel were more frequently separated from their families (both voluntarily and involuntarily) than shore personnel, a condition that existed for the sample as a whole and for most — but not all — of the pay grade groups. However, we found no other significant ship-shore differences. The proportions living in private housing were similar (except for those in the lowest enlisted grades); average bedroom requirements were similar; and

TABLE A-2

LONG BEACH SPECIAL SURVEY: SELECTED SHIP - SHORE COMPARISONS

Variable	Category	Pay grade group						
		O6-O10	O4-O5	W1-O3	E7-E9	E4-E6	E1-E3	Total
Number of responses	Shore Ship	29	103	133	71	96	33	465
		4	50	132	104	104	123	517
Voluntarily separated	Shore Ship (Test) ^a	17%	10%	7%	20%	9%	15%	11%
		0%	28%	13%	19%	22%	16%	18%
		(98%)	(99%)	(90%)	(6%)	(99%)	(12%)	(99%)
Involuntarily separated	Shore Ship (Test)	0%	7%	5%	7%	0%	6%	5%
		0%	8%	5%	9%	4%	23%	10%
		(0%)	(21%)	(21%)	(30%)	(95%)	(99%)	(99%)
Live in private housing	Shore Ship (Test)	67%	73%	74%	63%	61%	92%	70%
		50%	66%	72%	61%	64%	76%	68%
		(46%)	(58%)	(25%)	(21%)	(28%)	(97%)	(48%)
Unsuitably housed	Shore Ship (Test)	21%	18%	8%	20%	20%	19%	16%
		50%	9%	24%	17%	15%	21%	19%
		(79%)	(88%)	(99%)	(35%)	(62%)	(16%)	(71%)
Number of bedrooms ^b	Shore Ship (Test)	2.17	2.27	1.98	2.75	2.01	1.54	2.14
		2.50	2.44	2.03	2.51	2.09	1.65	2.09
		(38%)	(62%)	(35%)	(78%)	(47%)	(63%)	(56%)

^a Confidence level for t-test of difference between ship and shore results.

^b Average number of bedrooms authorized under current DoD rules.

although the proportion that was unsuitably housed tended to be slightly higher for ship personnel than for shore personnel, that difference was only statistically significant for junior and warrant officers.

IMPLICATIONS

In general, these findings substantiate the validity of NAVFAC's use of shore personnel to make inferences about ship personnel in the family housing questionnaire (and thus in the rest of the requirements determination process). The one obvious ship-shore difference was in separation rates. However, NAVFAC has already acknowledged and (at least partially) accounted for this difference by instructing FACSO to include in its programs adjustment factors that boost separation rates for selected complexes with significant ship-based populations.

These adjustment factors are shown in Table A-3. They equal the proportions by which both voluntary and involuntary separations on the final DD 1377 and the DD 1378 are increased (over the levels implied by DD 1376 data) for the specified pay grade groups at each of the six affected complexes.

TABLE A-3
CURRENT NAVFAC SEPARATION ADJUSTMENT FACTORS
(Percent)

Complex	W1-O10	E4-E9	E1-E3
New London, Conn.	15	25	35
Norfolk, Va.	25	35	55
Mayport, Fla.	25	35	55
Charleston, S.C.	20	30	40
San Diego, Calif.	25	35	55
Hawaii	25	35	55

These factors represent the combined effects of the ship-shore population mix and the ship-shore difference in separation rates. For example, if 50 percent of the population is ship-based, and if separation rates for those ship personnel are 50 percent higher (than shore), the appropriate adjustment factor would be 25 percent (0.50×0.50).

For the Long Beach sample, Table A-1 shows that 54 percent (785 of 1,448) of the population was ship-based and Table A-2 shows that combined voluntary and involuntary separation rates were 79 percent higher (.281 versus .157) for ship personnel. This means that if only shore personnel had been included in the survey, the resulting combined separation rate would have to be adjusted upwards by about 43 percent (0.54×0.79) to reflect the missing ship personnel.

Our results suggest that the factors shown in Table A-3 are the correct order of magnitude but may need to be updated. In addition, factors should probably be calculated for other complexes with large ship populations. Survey availability rates could be used to help estimate the ship-shore mix, while the data in Table A-2 could be used to help estimate ship-shore separation rate differences. Because the

ship-shore mix at a complex can vary over time, all of these factors should ideally be recalibrated annually.

APPENDIX B

DETAILED DD FORM CALCULATIONS

Although the process by which the Naval Facilities Engineering Command (NAVFAC) determines its family housing requirements is conceptually simple, a large number of calculations are involved and many of them are quite complex. To supplement the summary descriptions in Chapter 6 of the main paper, we have also prepared this appendix showing the detailed calculations underlying the raw data Form DD 1377 (Figure B-1), the Form DD 1377 (Figure B-2), the Form DD 1378 (Figure B-3), and the Form DD 1523 (Figure B-4). Each of these exhibits shows the calculations used to generate the initial values of each cell in the respective form.

For ease of interpretation and use, we have taken a few shortcuts. Since many of the calculations are essentially the same for all pay grade groups, we sometimes show one basic formula for multiple columns in a line. Similarly, we sometimes show one basic formula for several different lines. Finally, in a few cases we show a simplified version of the actual formula which includes all of the key components without spelling out all of the intermediate calculations.

DD1377 (RAW DATA) - TABULATION OF FAMILY HOUSING SURVEY

1 DATE OF SURVEY

REQUIREMENTS	OFFICERS		ELIGIBLE ENLISTED	KEY CIVILIANS	SUBTOTAL (A+B+C)	OTHER ENLISTED	TOTAL (D+E)
	A	B					
2 Total Personnel Strength	"B" Document Lines (A)5a, (B)9a, (C)9a, (E)7a						
3 Permanent Housing Strength	"B" Document Lines (A)5b+5d, (B)6b+6d, (C)8b, (E)7b+7d						
4 Number of Families	"B" Document Lines (A)5c+5e, (B)6c+6e, (C)8c, (E)7c+7e						
5 Housing Requirements Factor	100 x Line 4/Line 3						
NOT LIVING WITH FAMILY - STATUS OF HOUSING							
6 Not living with Family	Line 7 + Line 10						
7 Involuntarily Separated Families	Line 8 + Line 9						
8 Prefer Military Quarters	Survey Data - Questions 8 and 9 (=3)						
9 Prefer Private Housing	Survey Data - Questions 8 and 9 (=4)						
10 Voluntarily Separated Families	Survey Data - Questions 8 and 9 (=2)						
LIVING WITH FAMILY IN AREA							
11 Living with Family in Area	Line 12 + Line 19						
12 Suitably Housed	Line 13 + Line 16						
13 In Military Controlled Housing	"G" Document Sum of Lines (A)6a - c, (B)7a - c, (C)9a - c, (E)8a - c						
14 Prefer Renting Off Post	Survey Data - Question 11(=6) and Question 12(=7)						
15 Prefer Owning Off Post	Survey Data - Question 11(=6) and Question 12(=6)						
16 In Private Housing	Survey Data - Question 11(=1,4,5) and HSC(=1)						
17 Prefer Military Quarters	Survey Data - Question 12(=9)						
18 Prefer Renting Off Post	Survey Data - Question 12(=7)						
19 Unsuitably Housed	Line 20 + Line 23						
20 In Military Controlled Housing	"G" Document Lines (A)6d, (B)7d, (C)9d, (E)8d						
21 Prefer Renting Off Post	Survey Data - Question 11(=7) and Question 12(=7)						
22 Prefer Owning Off Post	Survey Data - Question 11(=7) and Question 12(=6)						
23 In Private Housing	Line 26 + Line 27 + Line 28						
24 Prefer Military Quarters	Survey Data - Question 11(=1,4,5) & HSC(not=1) & Question 12(=9)						
25 Prefer Renting Off Post	Survey Data - Question 11(=1,4,5) & HSC(not=1) & Question 12(=7)						
26 Excess Distance	Survey Data - Question 11(=1,4,5) and HSC(=2)						
27 Substandard	Survey Data - Question 11(=1,4,5) and HSC(=3, C)						
28 Excess Cost Only Over MAHC	Sum Lines 29 - 33						
29 Less than \$5	Survey Data - Question 11(=1,4,5) and HSC(=4)						
30 \$5 - \$10	Survey Data - Question 11(=1,4,5) and HSC(=5)						
31 \$10 - \$25	Survey Data - Question 11(=1,4,5) and HSC(=6)						
32 \$25 - \$50	Survey Data - Question 11(=1,4,5) and HSC(=7)						
33 \$50 and More	Survey Data - Question 11(=1,4,5) and HSC(=8)						

FIG. B-1. DD1377 (RAW DATA) - TABULATION OF FAMILY HOUSING SURVEY

HOUSING OCCUPIED IN AREA

	OWNED	OFFICERS ENLISTED	ELIGIBLE ENLISTED	KEY CIVILIANS	SUBTOTAL (A+B+C)	OTHER ENLISTED	TOTAL (D+E)
		A	B	C	D	E	F
34	In Owner Occupied Homes	Line 35 + Line 36					
35	Suitable in All Respects	Survey Data - Question 11(=4) and HSC(=1)					
36	Unsuitable	Sum of Lines 37 - 39					
37	Excess Distance	Survey Data - Question 11(=4) and HSC(=2)					
38	Substandard	Survey Data - Question 11(=4) and HSC(=3,C)					
39	Excess Cost Only	Survey Data - Question 11(=4) and HSC(=4,5,6,7,8)					
40	In Owner Occupied Trailers	Line 41 + Line 42					
41	Suitable in All Respects	Survey Data - Question 11(=5) and HSC(=1)					
42	Unsuitable	Sum of Lines 43 - 45					
43	Excess Distance	Survey Data - Question 11(=5) and HSC(=2)					
44	Substandard	Survey Data - Question 11(=5) and HSC(=3,C)					
45	Excess Cost	Survey Data - Question 11(=5) and HSC(=4,5,6,7,8)					

RENTED

46	In Rented Housing Off Post	Line 47 + Line 48					
47	Suitable in All Respects	Survey Data - Question 11(=1) and HSC(=1)					
48	Unsuitable	Sum of Lines 49 - 51					
49	Excess Distance	Survey Data - Question 11(=1) and HSC(=2)					
50	Substandard	Survey Data - Question 11(=1) and HSC(=3,C)					
51	Excess Cost Only	Survey Data - Question 11(=1) and HSC(=4,5,6,7,8)					

MILITARY

52	In Military Controlled Housing	Line 53 + Line 57					
53	Adequate as Public Quarters	Sum of Lines 54 - 56					
54	Military Owned	*G* Document Line (A)8a, (B)7a, (C)9a, (E)8a					
55	Military Leased	*G* Document Line (A)8b, (B)7b, (C)9b, (E)8b					
56	Military Sponsored	*G* Document Line (A)8c, (B)7c, (C)9c, (E)8c					
57	Inadequate as Public Quarters	*G* Document Line (A)8d, (B)7d, (C)9d, (E)8d					

VACANT HOUSING

58	Vacant Housing	Sum of Lines 59 - 61					
59	Private Rental Housing	*D* Document Lines (A)8a - c, 7a - c, 8a - c; (B)8d - e, 7d - e, 8d - e; (C)9g - h, 7g - h, 8g - h; (E)8f, 7f, 8f					
60	FHA & VA Held Rental Housing	*E* Document Lines (A)8a - c, 7a - c, 8a - c; (B)8d - e, 7d - e, 8d - e; (C)9g - h, 7g - h, 8g - h; (E)8f, 7f, 8f					
61	Military Housing Adequate as Public Quarters	*G* Document Lines (A)10a, (B)10b, (C)10c, (E)10d					

FIG. B-1. DD1377 (RAW DATA) - TABULATION OF FAMILY HOUSING SURVEY (Continued)

DD1377 (RAW DATA) - TABULATION OF FAMILY HOUSING SURVEY

INSPECTED RESULTS

INSPECTED RESULTS

	OFFICERS A	ELIGIBLE ENLISTED B	KEY CIVILIANS C	SUBTOTAL (A+B+C) D	OTHER ENLISTED E	TOTAL (D+E) F
82 Number of Unsuitable Units Inspected	Survey Data - Confirm Reverse(=1 or 2)					
83 Number of Inspected Units Reclassified	Survey Data - Confirm Reverse(=2)					
84 Adjustment Factors	(Line 4 - Line 6 - Line 52)/(Line 16 + Line 23)					
85 Name and Location of Installation						

	REQUIREMENTS NUMBER A		PERCENT B		MILITARY CONTROL C		SUITABLE HOUSING OFF POST D		TOTAL (C+DL+DR) E		DEFICIT (A-E) F	
	AL	AR					DL	DR				
86 O - 10 THRU O - 6	Sum of lines 67, 68, 69 except column B = (Columns AL + AR)/Line 108 (Columns AL + AR)											
(70, 74, 82, 88, 98, 102, 110)	AL: Questions 8A9 (= 1.3.4) Question 11 (= 6.7) Question 10 (< 3)											
87 1 and 2 Bedrooms	AR: Questions 8A9 (= 1.3.4) Question 11 (= 1.4.5) Question 10 (< 3)											
	C: "F" Document Line 8a(1)											
	DL: "D" Document Line 8a + "E" Document Line 8a											
(71, 75, 83, 87, 99, 103, 111)	DR: Column AR + Survey Data HSC (= 1)											
88 3 Bedrooms	AL: Questions 8A9 (= 1.3.4) Question 11 (= 6.7) Question 10 (= 3)											
	AR: Questions 8A9 (= 1.3.4) Question 11 (= 1.4.5) Question 10 (= 3)											
	C: "F" Document Line 8a(2)											
	DL: "D" Document Line 7a + "E" Document Line 7a											
(72, 76, 84, 88, 100, 104, 112)	DR: Column AR + Survey Data HSC (= 1)											
89 4 or more Bedrooms	AL: Questions 8A9 (= 1.3.4) Question 11 (= 6.7) Question 10 (> 3)											
	AR: Questions 8A9 (= 1.3.4) Question 11 (= 1.4.5) Question 10 (> 3)											
	C: "F" Document Line 8a(3)											
	DL: "D" Document Line 8a + "E" Document Line 8a											
(73, 77, 85, 89, 101, 105, 113)	DR: Column AR + Survey Data HSC (= 1)											

NOTES: (1) The logic used in lines 86 through 89 is also used for the remaining lines 70 - 113 of this form.
The like lines are annotated in parentheses at the bottom of the left hand block.
(2) Lines 76 - 81, 90 - 93, 94 - 97, 106 - 109 are totals for officers, enlisted, all military, and all eligible categories.

FIG. B-1. DD1377 (RAW DATA) - TABULATION OF FAMILY HOUSING SURVEY (Continued)

DD1377 - TABULATION OF FAMILY HOUSING SURVEY

	OFFICERS		ELIGIBLE ENLISTED	KEY CIVILIANS		SUBTOTAL (A+B+C)	OTHER ENLISTED	TOTAL (D+E)
	A	B		C	D			
19 Unsuitably Housed	Line 20 + Line 23							
20 In Military Controlled Housing	Raw 1377 Line 20							
21 Prefer Renting Off Post	Raw 1377 Line 21							
22 Prefer Owning Off Post	Raw 1377 Line 22							
23 In Private Housing	A: (Line 11A-Line 76C-Line 61)x(1 - Raw 1377 Line 76DR/Raw 1377 Line 76AR) B: (Line 11B-Line 90C-Line 61)x(1 - Raw 1377 Line 90DR/Raw 1377 Line 90AR) C: Line 4C-Line 6C-Line 13C-Line 16C-Line 20C E: Line 4E-Line 6E-Line 13E-Line 16E-Line 20E							
	* Calculated separately for each paygrade group.							
24 Prefer Military Quarters	Raw 1377 Line 24/Raw 1377 Line 23							
25 Prefer Renting Off Post	Raw 1377 Line 25/Raw 1377 Line 23							
26 Excess Distance	Raw 1377 Line 26/Raw 1377 Line 23							
27 Substandard	Line 23 - Line 26 - Line 28							
28 Excess Cost Only Over MAHC	Sum of Lines 29 - 33							
29 Less than \$5	Raw 1377 Line 29/Raw 1377 Line 23							
30 \$5 - \$10	Raw 1377 Line 30/Raw 1377 Line 23							
31 \$10 - \$25	Raw 1377 Line 31/Raw 1377 Line 23							
32 \$25 - \$50	Raw 1377 Line 32/Raw 1377 Line 23							
33 \$50 and More	Raw 1377 Line 33/Raw 1377 Line 23							
HOUSING OCCUPIED IN AREA								
OWNED								
34 In Owner Occupied Homes	Line 35 + Line 36							
35 Suitable in All Respects	(Raw 1377 Line 35/Raw 1377 Line 16)xLine 16							
36 Unsuitable	Sum of Lines 37 - 39							
37 Excess Distance	(Raw 1377 Line 37/Raw 1377 Line 23)xLine 23							
38 Substandard	(Raw 1377 Line 38/Raw 1377 Line 23)xLine 23							
39 Excess Cost Only	(Raw 1377 Line 39/Raw 1377 Line 23)xLine 23							
40 In Owner Occupied Trailers	Line 41 + Line 42							
41 Suitable in All Respects	(Raw 1377 Line 41/Raw 1377 Line 16)xLine 16							
42 Unsuitable	Sum of Lines 43 - 45							
43 Excess Distance	(Raw 1377 Line 43/Raw 1377 Line 23)xLine 23							
44 Substandard	(Raw 1377 Line 44/Raw 1377 Line 23)xLine 23							
45 Excess Cost	(Raw 1377 Line 45/Raw 1377 Line 23)xLine 23							

FIG. B-2. DD1377 - TABULATION OF FAMILY HOUSING SURVEY (Continued)

DD1377 - TABULATION OF FAMILY HOUSING SURVEY

RENTED

46	In Rented Housing Off Post	Line 47 + Line 48
47	Suitable in All Respects	Line 16 - Line 35 - Line 41 + 'E' Document Line (B) 9a, (E) 9b
48	Unsuitable	Line 23 - Line 36 - Line 42
49	Excess Distance	Line 26 - Line 37 - Line 43
50	Substandard	Line 46 - Line 49 - Line 51
51	Excess Cost Only	Line 28 - Line 39 - Line 45

MILITARY

	OFFICERS	ELIGIBLE ENLISTED	KEY CIVILIANS	SUBTOTAL (A+B+C)	OTHER ENLISTED	TOTAL (D+E)
	A	B	C	D	E	F
52	In Military Controlled Housing	Line 53 + Line 57				
53	Adequate as Public Quarters	Vacant	Sum of Lines 54 - 56			
54	Military Owned	Vacant	Raw 1377 Line 54			
55	Military Leased	Vacant	Raw 1377 Line 55			
56	Military Sponsored	Vacant	Raw 1377 Line 56			
57	Inadequate as Public Quarters	Vacant	Raw 1377 Line 57			

VACANT HOUSING

58	Vacant Housing	Sum of Lines 59 - 61
59	Private Rental Housing	Raw 1377 Line 59
60	FHA & VA Held Rental Housing	Raw 1377 Line 60
61	Military Housing Adequate as Public Qtrs	Raw 1377 Line 61

INSPECTED RESULTS

62	Number of Unsuitable Units Inspected	Raw 1377 Line 62
63	Number of Inspected Units Reclassified	Raw 1377 Line 63

Adjustment Factors

64	Adjustment Factors	A & C: (Line 4 - Line 6 - Line 52)/(Raw 1377 Line 16 + Raw 1377 Line 23) B: (Line 4 - Line 6 - Line 52 - 'E' Document Occupied Units E4 - E9)/(Raw 1377 Line 16 + Raw 1377 Line 23) E: (Line 4 - Line 6 - Line 52 - 'E' Document Occupied Units E1 - E3)/(Raw 1377 Line 16 + Raw 1377 Line 23)
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65 Name and Location of Installation

FIG. B-2. DD1377 - TABULATION OF FAMILY HOUSING SURVEY (Continued)

DD1377 - TABULATION OF FAMILY HOUSING SURVEY

	REQUIREMENTS		SUITABLE HOUSING		DEFICIT (A-E) F
	NUMBER	PERCENT	MILITARY OFF POST CONTROL	TOTAL (C+D) E	
	A	B	C	D	F
66 O-10 THRU O-6	A: (8" Document Line 9a/8" Document Line 9a + 9b + 9c) x (Line 4 - Line 10) C: Line 67 + Line 68 + Line 69 D: Line 18A x (8" Document Line 9a/8" Document Line 9a + 9b + 9c) + Raw 1377 Line 66AL 66D: Line 18A x (8" Document Line 9a/8" Document Line 9a + 9b + 9c) + Raw 1377 Line 66AL + "E" Document Line 9a 1100: Line 18A x (8" Document Line 9a/8" Document Line 9a + 9b + 9c) + Raw 1377 Line 66AL + "E" Document Line 9b				
(70, 74, 82, 86, 98, 102, 110) 1 and 2 Bedrooms	A: Line 66 - Line 68 - Line 69 C: Raw 1377 Line 67C				
(71, 75, 83, 87, 99, 103, 111) 3 Bedrooms	D: Line 66 - Line 68 - Line 69 A: Line 66 x (Raw 1377 Line 66AL + Raw 1377 Line 66AR) / (Raw 1377 Line 66AL + Raw 1377 Line 66AR)				
(72, 76, 84, 88, 100, 104, 112) 4 or more Bedrooms	C: Raw 1377 Line 68C D: Line 66 x Raw 1377 Line 66AR / Raw 1377 Line 66AR				
(73, 77, 85, 89, 101, 105, 113)	A: Line 66 x (Raw 1377 Line 66AL + Raw 1377 Line 66AR) / (Raw 1377 Line 66AL + Raw 1377 Line 66AR) C: Raw 1377 Line 69C D: Line 66 x Raw 1377 Line 66AR / Raw 1377 Line 66AR				

NOTES: (1) The logic used in lines 66 through 69 is also used for the remaining lines 70 - 113 of this form.
The like lines are annotated in parentheses at the bottom of the left-hand block.
(2) Lines 76 - 81, 90 - 93, 94 - 97, 106 - 109 are totals for officers, enlisted, all military, and all eligible categories.

FIG. B-2. DD1377 - TABULATION OF FAMILY HOUSING SURVEY (Continued)

DD1378 - DETERMINATION OF HOUSING REQUIREMENTS AND PROJECT COMPOSITION

DERIVATION OF LONG - RANGE HOUSING REQUIREMENTS

	OFFICERS		ENLISTED				TOTAL (A-G)
	Operational A	Students B	Operational Eligible C	Other D	Students Eligible E	Other F	
1 Total Personnel Strength	A: "J" Document Line 5a - 5c - 5d B: "J" Document Line 5c + 5d C: "J" Document Line 6a - 6c - 6d D: "J" Document Line 7a - 7c - 7d E: "J" Document Line 6c + 6d F: "J" Document Line 7c + 7d G: "J" Document Line 6a						H
2 Permanent Party Housing Strength	A: "J" Document Line 5b B: "J" Document Line 5c C: "J" Document Line 6b D: "J" Document Line 7b E: "J" Document Line 6c F: "J" Document Line 7c G: "J" Document Line 6c						
3 Housing Requirements Factor	Family Housing Marriage Factors (3 year average)						
4 Gross Housing Requirements	Line 2xLine 3/100						

DERIVATION OF LONG - RANGE HOUSING DEFICIT

	OFFICERS	ELIGIBLE ENLISTED	KEY CIVILIANS	SUBTOTAL NUMBER	(A+B+C) PERCENT	OTHER ENLISTED	TOTAL
	A	B	C	D	E	F	G
5 Gross Eligible Housing Requirements	A: Line 4A+Line 4B B: Line 4C+ Line 4E C: Line 4G F: Line 4D+Line 4F						
6 Voluntarily Separated Families	Line 5x(Fin 1377 Line 10/Fin 1377 Line 4)						
7 Effective Housing Requirements (5 minus 6)	Line 5 - Line 6						
8 Programming Requirement	Line 7xProgramming Factor						
9 Suitable Housing Assets (Total 10+16)	Line 10+Line 16						
10 Military Controlled Assets (Subtotal 11 - 15)	Sum of Lines 11 - 15						
11 Military Owned - Existing	Use "K" document if exists, else (Fin 1377 Line 53+Fin 1377 Line 61) - "O" Document.						
12 Military Owned - Under Contract	"L" Document						
13 Military Owned - Approved	"M" Document						
14 Military Leased - Existing & Approved	"N" Document						
15 Other (Specify)	Use "P" document if exists, else Fin 1377 Line 57.						

FIG. B-3. DD1378 - DETERMINATION OF HOUSING REQUIREMENTS AND PROJECT COMPOSITION

DD1378 - DETERMINATION OF HOUSING REQUIREMENTS AND PROJECT COMPOSITION

DERIVATION OF LONG-RANGE HOUSING DEFICIT CONTINUED

	OFFICERS A	ELIGIBLE ENLISTED B	KEY CIVILIANS C	SUBTOTAL NUMBER D	PERCENT ENLISTED E	OTHER ENLISTED F	TOTAL G
16 Not Military Controlled (Subtotal 17-21)	Sum of Lines 17-21						
17 Currently Occupied - Owned	Fin 1377 Line 35 + Fin 1377 Line 41						
18 Currently Occupied - Rented	Fin 1377 Line 47						
19 Currently Vacant - Private for Rent	Fin 1377 Line 59						
20 Currently Vacant - FHA and VA for Rent	Fin 1377 Line 60						
21 Under Construction or Firmly Planned	*O* Document						
22 Net Housing Deficit (7 minus 9)	Line 7 - Line 9						
23 Programming Deficit	Line 22xProgramming Factor						
Programming Deficit (8 minus 9)	(Line 8xProgramming Factor) - Line 9						

QUALITATIVE ANALYSIS OF REQUIREMENTS

	REQUIREMENTS			SUITABLE HOUSING			NET		PROGRAM DEFICIT 90% OF G
	EFFECTIVE	PERCENT	PROGRAM LIMIT	MILITARY CONTROL	OFF POST	TOTAL (D+E)	F	G	
A	B	C	D	E	F			H	
55	O - 10 THRU O - 6	A: Line 67xFin 1377 Line 66/Fin 1377 Line 78 C: A: Programming Limit D: Sum of Lines 56 - 58 E: Sum of Lines 56 - 58							
56	(59, 63, 71, 75, 87, 91 99) 1 and 2 Bedrooms	A: Lin 55 - Line 57 - Line 58 D: [Use 'K' document if exists, else Fin 1377 Line 67C] + 'L' Document + 'M' Document + 'N' Document + 'P' Document - 'O' Document E: 'O' Document + Fin 1377 Line 67D							
57	(60, 64, 72, 76, 88, 92, 100) 3 Bedrooms	A: Line 55AxWorld Wide Bedroom Factor (specified grade)/100 D: [Use 'K' document if exists, else Fin 1377 Line 68C] + 'L' Document + 'M' Document + 'N' Document + 'P' Document - 'O' Document E: 'O' Document + Fin 1377 Line 68D							
58	(61, 65, 73, 77, 89, 93, 101) 4 or more Bedrooms	A: Line 55AxWorld Wide Bedroom Factor (specified grade)/100 D: [Use 'K' document if exists, else Fin 1377 Line 69C] + 'L' Document + 'M' Document + 'N' Document + 'P' Document - 'O' Document E: 'O' Document + Fin 1377 Line 69D							
59	(62, 66, 74, 78, 90, 94, 102)								

- NOTES: (1) Lines 24-54 are project-specific and are not generated by FACSO.
(2) The logic used in lines 55 through 58 is also used for the remaining lines 59-102 of this form.
(3) The like lines are annotated in parentheses at the bottom of the left-hand block.
(4) Lines 67-70, 79-82, 83-86, 95-98 are totals by officers, enlisted, all military, and all eligible categories.

FIG. B-3. DD1378 - DETERMINATION OF HOUSING REQUIREMENTS AND PROJECT COMPOSITION (Continued)

MILITARY FAMILY HOUSING JUSTIFICATION				1. Date Of Report		2. Fiscal Year		Report Control Symbol	
3. DOD Component		4. Reporting Installation							
5. Data As Of		a. Name		b. Location					
ANALYSIS OF REQUIREMENTS AND ASSETS				CURRENT			PROJECTED		
				Officer (a)	E9-E4 (b)	E3-E1 (c)	TOTAL (d)	Officer (e)	E9-E4 (f)
6. Total Personnel Strength				DD 1377 Line 2			DD 1378 Line 1		
7. Permanent Party Personnel				DD 1377 Line 3			DD 1378 Line 2		
8. Gross Family Housing Requirements				DD 1377 Line 4			DD 1378 Line 4		
9. Total Unacceptably Housed				9a+9b+9c					
a. Involuntarily Separated				DD 1377 Line 7					
b. Unacceptably Housed - Military Assets				DD 1377 Line 20					
c. Unacceptably Housed - Community Assets				DD 1377 Line 23					
10. Voluntary Separations				DD 1377 Line 10			DD 1378 Line 6		
11. Effective Housing Requirements				8-10			8-10		
12. Adequate Housing				12a+12b			12a+12b		
a. Under Military Control				12a1+12a3+12a4			12a1+12a2		
(1) Housed in Existing DOD Owned/Controlled				DD 1377 Line 53			DD 1378 Lines 11+14		
(2) Under Contract/Approved							DD 1378 Lines 12+13		
(3) Vacant				DD 1377 Line 61					
(4) Inactive				(DD Form 1410)					
b. Private Housing				12b1+12b2			12b1+12b2		
(1) Acceptably Housed				DD 1377 Line 16			DD 1378 Lines 17+18		
(2) Vacant Rental Housing				DD 1377 Lines 59+60			DD 1378 Lines 19+20+21		
13. Effective Housing Deficit				11-12			11-12		
14. Proposed Project							{Proposed Project}		
15. Total Housing Assets As Percentage Of Projected Effective Requirements				a. Military			(12a+14)/11		
				b. All Housing			(12+14)/11		
16. REMARKS									

DD 1523 (NOV 85)

Note: Alternative sources may be used for many cells (e.g., market analysis for line 12b2)

FIG. B-4. DD1523 - MILITARY FAMILY HOUSING JUSTIFICATION

REPORT DOCUMENTATION PAGE

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